SEPTEMBER, 1933

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Contractors and Engineers Monthly

7TH TIER

Excavating Material with a Dragline and Loading to a Belt Conveyor on an Ohio Stream Diversion and Dike Contract
See Page 21

BRUTE STRENGTH

PERFECT CONTROL

LIKE the perfectly trained circus elephant, EUCLID BULLDOZERS combine brute strength with instant—positive control. Hundreds of jobs like this one are proving that Euclids are built to take it and stand up.

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there are definite reasons for the increasing preference for

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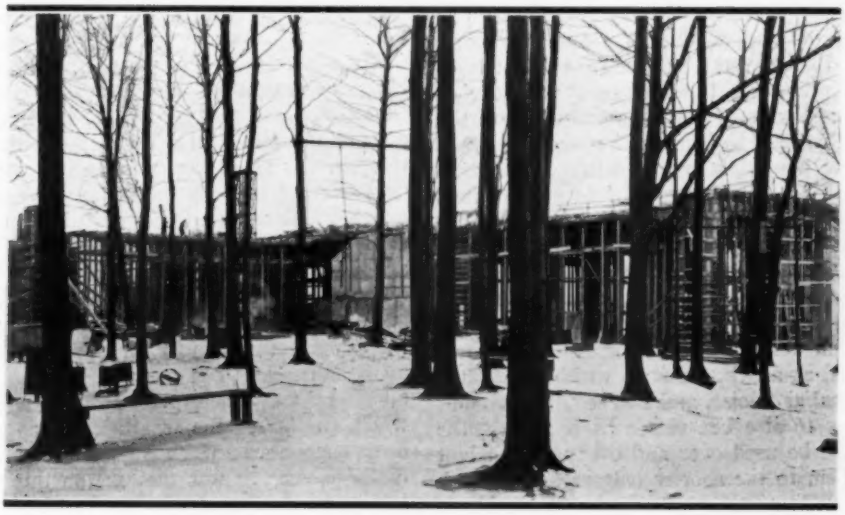
A 4,000,000-Gallon Elevated Storage Tank



Methods Used by the Contractors in Erecting the New Record Tank at Sheboygan, Wisconsin

EXCEEDINGLY heavy concrete construction carried on in winter characterized the erection of the new 4,000,000-gallon steel water tank for the City of Sheboygan, Wis. The contractor was fortunate in having mild weather each time a major pour was scheduled but he was ready for the worst of weather, believing that the weather is no respecter of contractors. As the ornamental concrete and brick structure surrounding the steel tank was nearly completed before the tank was started, the contractor for the tank found certain new problems in handling the steel plates through a breach in the brick curtain wall.

The new tank was built to provide equalizing storage for the domestic water supply of the city at the opposite end of the city from the pumping station. It is located on Taylor Hill in the center of a county park, 2½ acres of which was purchased by the city for this purpose. The tank is almost directly west of the center of population of the city and 2½ miles from the shores of Lake Michigan at an elevation of 153 feet above city datum which is 2 feet higher than the government datum for Lake Michigan. The bottom of the tank is 27 feet above the ground elevation given above and the tank will carry 20 feet of water with 1 foot 7 inches of freeboard. A 30-inch main had been laid from the city distribution system to connect with the 30-inch riser of the tank and an 18-inch overflow pipe is provided. The elevation of the water in the tank, to prevent wastage, is controlled by an automatic cone valve.

The removal of black top soil, for future top backfill, the cutting off and leveling of the site and the excavation of the eighty footings was done by hand to increase employment. This crew consisted of four teams and wheel scrapers and eight men for the squaring of excavations and other necessary hand work.

Supporting Structure Built in Winter

The enormous weight of the tank and its contents when filled required the construction of a very heavy reinforced supporting structure with large footings. Practically all of this work was done in winter as the first excavation for the footings was started on October

Setting Steel for the 16-Inch Concrete Floor Slab

17, 1932, and continued throughout the winter with the construction divided into four parts. The structure was divided into quadrants, because of the large amount of material necessary for the framing of the forms such as beams, girders, drophead panels, piers and slab deck. One quarter of the structure required six carloads of lumber, most of which was 2-inch material and heavier. The entire fabrication of forms was executed on the ground during the period of excavation, so that when the footings were poured, it was a matter of erection only. This work required a crew of four carpenters and foreman for the fabrication of forms, while the erection required two carpenters to fasten the different forms into place, and eight laborers to carry in and hoist the forms, with the aid of a 40-foot gin pole. Another crew of six men and foreman cut, erected and braced the shoring, which were 6 by 6-inch posts up to 36 feet in length. Thus, as all the columns within the structure were identical as to size, and all the outer columns were identical as to size but varied as to length, the same forms could be used over and over with a slight cutting to fit them to the shorter lengths as the work progressed.

The concrete structure consisted of fifty-two interior columns 30 inches in diameter with mushroom tops connecting with the 16-inch concrete slab that carried the bottom of the steel tank on a 2-inch sand cushion. These columns were reinforced with eighteen 1⅛-inch square bars with a ½-inch spiral spaced 2½ inches. The twenty-eight ornamental columns which do little but carry the 8-inch brick curtain wall surrounding the steel tank are reinforced with eleven ½-inch vertical bars. The forms for the outer columns, which are rectangular in cross section, were lined with plywood to give a smooth finish to lessen hand rubbing.

The footings for the interior columns were designed for a ground pressure of 5,500 pounds per square inch and are each 12 x 12 feet and 26 inches thick, reinforced with 1-inch round bars each way and hooked at the ends.

At the center of the structure an opening was left for the 30-inch riser pipe and the 18-inch overflow pipe. These, after being placed, were surrounded by brick structure 22 feet 6 inches square which also houses the pit containing the valves and the regulating valve. The riser was carried up flush with the bottom of the tank which has a pitch of 6 inches from the outer edge to the center.

Reinforcing Steel

The 16-inch slab is reinforced with bands of ¾-inch and ⅞-inch bars of billet steel running in both directions. Three hundred and ten tons of reinforcing steel were required for the entire structure and, due to the height of the slab, all the steel was conveyed to its place by means of a cable conveyor, driven by steam power. A crew of six to ten rod men and one foreman placed the entire reinforcing.

Concreting

The concrete for the entire structure, about 3,481 cubic yards, was mixed under complete control in a Koehring 27-E paver at a yard about 1½ miles from the site of the tank and hauled by trucks with steel bodies to the job. As all of the concrete was poured during the cold weather the aggregates and water were heated by a steam boiler so that the resulting concrete was delivered to the trucks at a temperature of 75 degrees and arrived at the job at a temperature of 70 degrees. The mixing crew was composed of a mixer operator, one man to fire the boiler and to rearrange the steam lines, three men on sand, four on stone and one man on cement and lime. Ten per cent of lime by volume was added to the concrete to produce a plastic concrete which eliminated the separation of aggregate, which is often encountered when concrete is conveyed any great distance, such as was the case on this job. The truck bodies were covered with tarpaulin to prevent, as far as possible, the loss of heat during transportation.

Such bulk concrete as the footings were poured directly into the forms from the trucks through chutes but for the columns the trucks dumped into the hoist bucket of an Insley tower which raised the concrete to a hopper above, from which the concrete was hauled by concrete carts to the forms. The concrete in the forms was vibrated during pouring with two electric vibrators to insure a compact mass around the heavy reinforcing and against the forms themselves. There was no evidence of honeycombing anywhere in the structure. The crew for placing the concrete consisted of a man at the receiving hopper, a hoist engineer, four men on concrete buggies wheeling the concrete from the hoist to the forms, two clean-out men and two men operating the electric vibrators. Before pouring, the forms were encased in tarpaulins hung on lattice frames surrounding them and the housed area heated with steam from a boiler and by salamanders. Chief reliance was placed on the salamanders for heat and the steam for supplying the moisture to the air to prevent drying out of the concrete during setting and curing. A 1:2:4 mix was used throughout the structure and strengths averaging 4,500 pounds per square inch were secured.

Removal of the forms was commenced as early as possible after the pouring and curing of concrete. The safety of form removal was governed by three, four, five and seven-day compressive tests. As soon as the necessary strength was obtained the stripping of forms was done; in most cases it required four or five days. A crew of eight to ten men did the stripping.

The entire exterior surface of the piers was ground

with an electric Carborundum grinding machine, as soon as the forms were removed, and again after the entire structure was completed. This gave the concrete surface a white smooth finish. Two men experienced in this work did the grinding.

A fleet of five 1-yard trucks hauled all of the concrete. The best pour for one day with this organization was 198 cubic yards, which was handled in 9½ hours.

BRICK WORK

The tank is completely masked by an 8-inch brick wall rising from the 16-inch slab supporting the tank and topped off with a copper flashing just under the steel roof of the tank. The brick was delivered to the job by truck and unloaded at strategic points around the base. A double-cage material elevator was used to raise the wheelbarrow loads of brick from the ground to the elevation of the scaffold built on the floor slab. A hoist engineer and two men made up the ground crew and two men pushing the barrows above distributed the brick to the twenty-nine brick masons who had ten helpers in all.

As the brick work was completed well in advance of the actual construction of the tank because of the need of using some of the tank space for scaffold, it was necessary to leave a breach in the wall for the steel men to use to hoist and carry in the plates for the tank. This opening was the width of three arches and was left until the tank was completed and the welders and other equipment removed from the 3-foot walkway area between the tank and the brick wall.

The brick wall was pierced by a series of windows with aluminum sashes with alternate windows made to open for ventilation of the area between the tank and wall.

ERECTING THE STEEL TANK

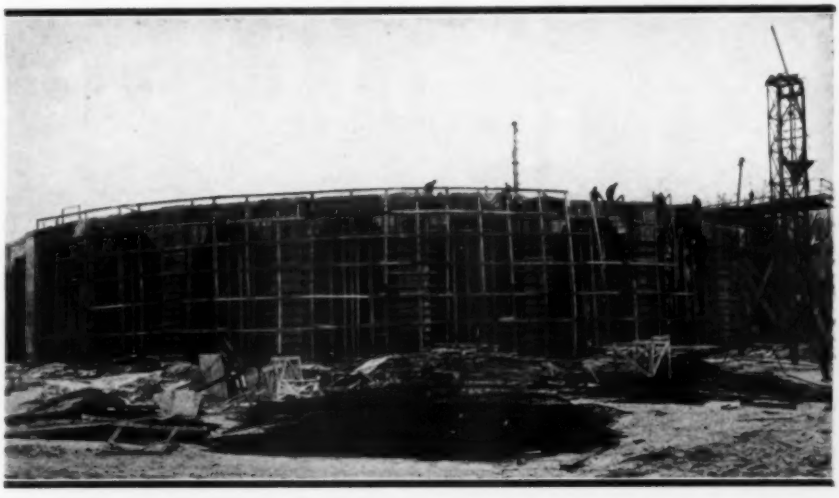
The steel tank which holds the 4,000,000 gallons of water in storage, is 185 feet in diameter and measures 21 feet 7 inches to the top of the side rings. The roof, made of 3/16-inch steel plates welded together, rises 1 foot in 8 to give a conical roof for strength and for shedding water. The tank was built with four rings, the lowest of ⅞-inch plate, and the top ring of 5/16-inch plate, the two intermediate plates being 21/32 and 7/16-inch. The bottom of the tank is of 5/16-inch plates also welded while the rings were all riveted. The first ring was welded directly to the bottom, without a bottom angle. The vertical and girth seams of the shell were riveted. The first ring of the shell was erected with the portable tower and the three upper rings were rolled into place by means of plate buggies such as are commonly used in the erection of oil storage tanks. The bottom of the tank, which was all welded, was laid directly on a 2-inch sand cushion. A Lincoln Stable Arc and a General Electric portable welder were used to supply the electric welding current. For the riveting a Sullivan and a Chicago-Pneumatic portable air compressor were hooked up to a single line to the tank.

The erection of the steel tank was started after the brick enclosure was constructed. As mentioned above, an opening was left in the enclosure through which the steel was passed. A gin pole about 40 feet high was set up on the edge of the substructure, the top of which was approximately 25 feet above the ground. This pole was used to raise the steel from the trucks to the slab which was to support the tank. A 2-ton Caterpillar tractor was used on the slab to pull a wagon which was used for placing the steel. A portable tower on wheels with a derrick on top was used to pick the bottom plates off the wagon and lay them in place.

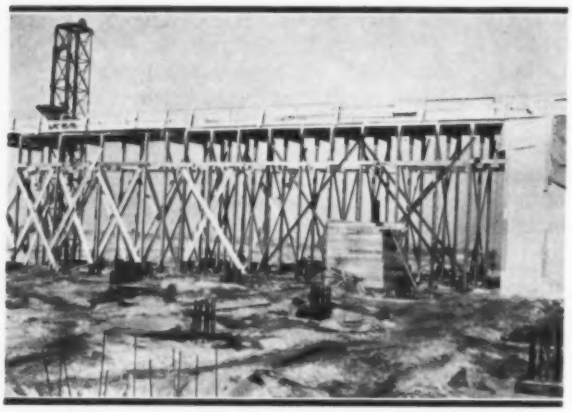
The roof was of all welded construction supported on steel framing and was erected with the portable tower.

On June 22, 1933, the tank bottom was tested for leakage in the welded joints by filling the tank to a depth of 10 inches with water and then blowing air into the area beneath the tank and the supporting floor where the sand cushion takes up any inequalities in the floor. The air was piped through taps in the tank bottom and was applied at a pressure of 10 pounds. A very few minor leaks indicated by bubbles were found which were marked and immediately corrected. The Resident Engineer expressed the hope before the test that there would be a few small leaks in order to indicate the completeness of the test, as a complete absence of bubbles might indicate a tight bottom or might only mean that the air was escaping through the sand bed.

The final work on the tank was the painting of its complete inside and outside. The bottom and the in-



Wood Forms for Exterior Columns and Lattice for Hanging Canvas to Enclose Structure for Heating



The Concreting Trestle for the Supporting Structure

side to the overflow line was painted with No-Ox-Id, using one coat, and the outside and roof were given two coats of aluminum paint. On the top of the tank the name of the city has been painted twice in 10-foot letters with a north arrow for the benefit of aviators.

GRADING

The surrounding grounds are to be graded to provide a park area. Immediately around the outer columns there is a 6-foot concrete walk with a curb and catch basins. Outside this there is a 14-foot grass plot graded to rise 6 inches in that distance so as to drain to the catch basins and then sloping on a 3 to 1 slope to meet the existing grade.

PERSONNEL

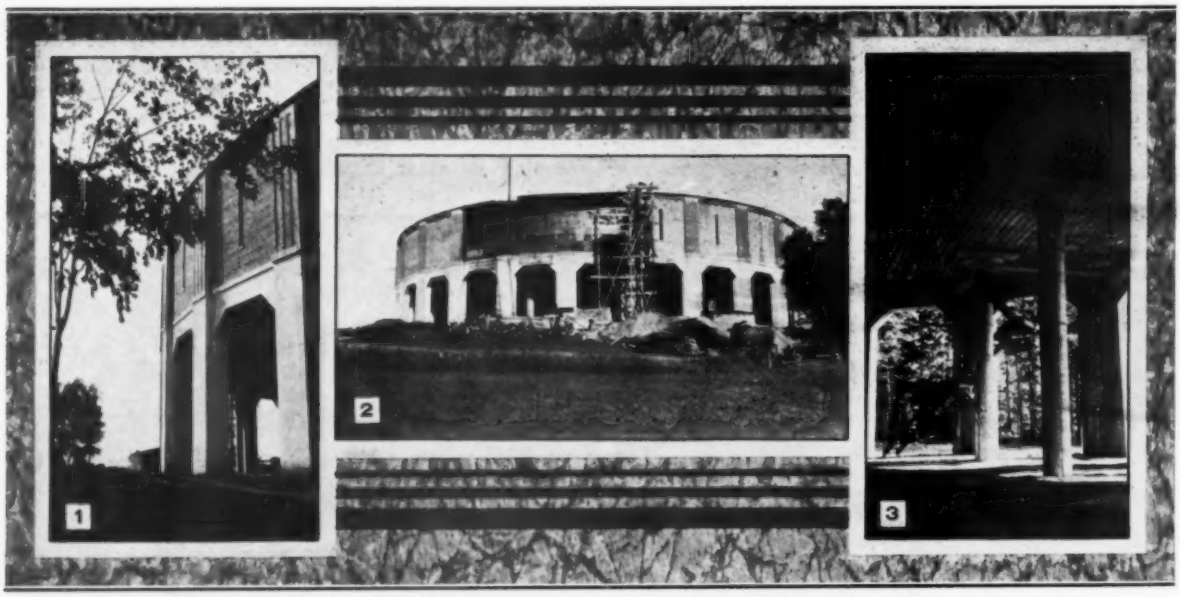
The general contractor for the supporting structure of the tank was the Immel Construction Co. of Fond du Lac, Wis., for whom William Scheer was Superintendent. The tank was furnished and erected by the Chicago Bridge & Iron Works of Chicago, Ill., with S. C. McCloud as Superintendent. The basic designs for the reservoir were made by Arthur H. Miller, Superintendent of the Sheboygan Water Department. The Jerry Donohue Engineering Co. acted as consultants on the project. Working plans and specifications for the reservoir were prepared by them with the assistance of Edgar Stubenrauch, Architect, also of Sheboygan. Professor W. S. Kinne of University of Wisconsin Engineering School staff checked the reinforced concrete design and calculations. J. C. Zufelt of the Water Department was Resident Engineer, with Fred Wedemeyer as Inspector.

Real Progress in the Fight Against Gas Tax Diversion

SUSTAINING the Illinois Construction Council's contention that amendments diverting gas tax money are not within the title of the motor fuel tax law and are an impairment of the obligation of contract, Judge L. E. Stone of the District Court of Sangamon County, Ill., on June 21, 1933, issued a decree permanently enjoining state and county officials from furnishing direct relief, from paying principle and interest on relief bonds, and from buying tax anticipation warrants with gas tax receipts.

The plaintiff contended that "taxes diverted from the motor fuel tax law were levied . . . to retire and pay bonds for road purposes; for the construction of new roads; and for maintenance purposes" and that it was a violation of the State constitution to divert them to any other use whatsoever.

This injunction is hailed by highway officials, construction interests and motorists as a victory of vital importance to the State's highway program and—with California's 3 to 1 vote against diversion and the ruling by a Cincinnati, Ohio, judge ordering the return of $159,803 which had been diverted to relief from motor license and gas tax allotments—another strong link has been created in the national back-to-normalcy chain.



THE 4,000,000-GALLON STORAGE TANK NEARING COMPLETION

1. *One portion of the tank just before grading of the surrounding area was started.* 2. *The breach in the brick wall showing the completed steel tank.* 3. *The area under the tank showing the exterior and interior columns and the stairway.*

Helpful Ideas Galore

Dunn Construction Co. Showed Efficient Operation on 17.4-Mile Concrete Paving Job from Darnell to Delhi, La.

RATHER than group the novel methods and tools that were evident on the Dunn Construction Co. paving job at the beginning of the text, we are going to distribute them in their proper sequence throughout the article. This job, which was one of the few under way in Louisiana during the summer of 1932, was also one of the last to be completed prior to the Federal requirement that hand labor replace machines in fine grading operations.

Rough Grading and Jetting the Fills

The 75,000 cubic yards of rough grading and the shoulders were handled with a P & H No. 500 dragline with a 45-foot boom and a 1-yard P & H bucket. The dragline was served by two 3½-ton Mack trucks, as the Louisiana specifications do not permit the placing of dirt in fills with a dragline. The contractor spread all the dirt in 12-inch layers from the trucks and all the fills over 3 feet in depth were jetted.

There were four 3-up fresnos and a Caterpillar Sixty with an 8-foot Atlas rotary scraper to handle the shallow cuts and to fill in the low spots in the fills. An Adams 12-foot leaning wheel grader with the Caterpillar Sixty bladed the top to insure as even a grade as possible. To finish the top a Caterpillar Junior No. 4 grader with a 7-foot 4-inch blade pulled by a truck was used.

For water for jetting the fills, a C. H. & E. No. 11 triplex pump was used, furnishing water at 125 pounds pump pressure and 75 pounds at the jets. This contractor has his own methods of handling the jetting operation. These methods are not required by the state specifications but the contractor believes that they are economical and they produce effective results entirely satisfactory to the state highway department. First a series of holes 2 feet deep and 5 feet on centers are dug with post hole diggers in the section to be jetted. Then the jets composed of 5-foot lengths of 1¼-inch pipe reduced to a jet ¾-inch in diameter at the end were permitted to work their way down with the water running under pressure. If the crust of the ground surface was too hard it was first plowed to permit the water that gathered at the top to penetrate into the fill over its entire area. A crew of three men and the pump man handled the jetting. The hose take-off for the jetting pipes was set every 300 feet in the main water line and the jets worked close together with varying lengths of the 1¼-inch hose. If it was found that the crust was thicker than could easily be broken up with the plow the entire surface was ponded until it softened enough to permit easy jetting.

Fine Grading and Form Setting

Well ahead of the form setting a Carr Formgrader cut the trench for the 9-inch steel forms made by the Birmingham Fabricating Co. of Birmingham, Ala. A 9-inch form was used although the specifications required only an 8-inch form. The difference was taken up in the trench. The Formgrader operator set the grade line ahead and then went back and cut the form trench. He was followed by the form setting crew, consisting of one form setter with three helpers and two men who cut any uneven trench true to line and grade behind the Formgrader. These same men, when not required for that work, assisted in unloading the forms and cleaning them. The form-setting crew also included two men who pulled the forms the day following pouring of the slab and who loaded them onto a 3-mule wagon. The driver assisted in this and drove the wagon forward.

The Utility Truck Bringing Up One of the Six 8,000-*Candlepower Carbic Lights*

Loading the Bag Cement

This kept the forms required down to a minimum and prevented any delay in having clean forms ready for the setters. The two pullers also shoveled the dirt against the slab when the forms were pulled to prevent the edge of the slab drying out during curing. Three liners and two tampers saw to it that the forms were true and on a foundation sufficiently firm so that the finishing machine or the subgrader would not disturb the line and grade and produce waves in the slab as poured and finished. These are cheaper to take out before they occur than they are to rub or chip out after the slab has set.

On the fine grade after the forms were set a Caterpillar Thirty pulled the Carr subgrader and a Caterpillar 2-ton tractor pulled an Atlas 5-foot rotary scraper. An 8-foot blade grader was also used behind the Thirty and a 6-foot Atlas rotary scraper was also used where a high spot was found or to take dirt into a low spot that was shown up by the subgrader. The grade was thoroughly compacted with a Huber 12-ton gas roller. A foreman and six laborers completed the fine grade crew.

Preparing the Batches

The set-up of the job geographically was something as follows: with Darnell at one end of the 17.4-mile stretch and Delhi at the other, the work was divided approximately in halves by the town of Epps at the center. The work ran approximately north and south with Darnell at the north end and Delhi at the south. The paving was done in five sections with the batching plant at Epps for the first four sections and at Delhi for the fifth. The first section paved was 4½ miles long, starting at Darnell and working south. The second section was from a point 2.9 miles south of the batching plant working north to the batching plant at Epps. The third section was the gap of 2½ miles north of the batching plant, working south. Then when it came time to pave further sections south of the batching plant, the trucks could haul over the second section paved. The fourth section was one mile in length and extended from the south end of the second section and worked south by driving around the fine grade on the old road. The fifth section which was paved with the batching plant at Delhi was 6.4 miles long and closed the south end of the contract working in a southerly direction.

For the first four sections the sand was received in gondola cars on a Missouri-Pacific spur at Epps and was shipped by the Parker Gravel Co. of Monroe, La., from its plant at Watts, La. The gravel was supplied by the Tennessee-Arkansas Gravel Co. from its Arkansas City plant. The aggregates were unloaded by a P & H crane with a 45-foot boom and a 1¼-yard Blaw-Knox clamshell bucket. Two small stockpiles were maintained but shipments were so regular that no large stockpiles were needed. A Blaw-Knox 2-compartment bin with weighing batchers completed the aggregate batching plant. The batches were made up of an average of 1,575 pounds of sand, 2,691 pounds of gravel including moisture content with seven bags of cement. The batching crew consisted of two men in the cars, a craneman, one man to clean up on the ground, and the batch man. The batch trucks drove forward under the batchers and backed under alternately to distribute the moist spot on the truck body so as to prevent an accumulation of moisture on one part of the paver skip which would cause the cement to stick.

The cement for about half of the contract was supplied by Marquette Cement Co., Cape Girardeau, Mo., and the other half by the Lone Star Cement Co., New Orleans, La. It was received in cloth bags by rail and unloaded direct from the cars to a runway. There were two negro laborers who loaded the seven bags of cement, each to his own hand truck and wheeled it out and up a slight grade to a platform from which it was tipped off onto the trucks. A loader at the tipping platform cut the bags just before they were dumped. The two wheelers were strapping negro laborers and readily handled the pushing of the seven-bag load up the 26-foot ramp which had a rise of about 3 feet. When one was off for a day or two it was necessary to put on an extra laborer to act as a booster on the ramp.

Hauling the Batches

There were a maximum of 18 Hug trucks with an average of 13 hauling batches, all owned by the subcontractor, Nixon-Phillips Contracting Co., of Birmingham, Ala. In addition the Dunn Construction Co. had two Macks and two International trucks hauling batches. The Hug and Mack trucks were 2-batch units and the Internationals hauled one batch each. All the trucks were equipped with dual pneumatic rear tires and steel bodies. The batches were paid for at a unit price delivered at the mixer no matter the distance hauled, thus overcoming any arguments as to the zone to which any particular batches might have been delivered.

The trucks stopped at a portable platform between 500 and 600 feet from the mixer where two men emptied the bags of cement and one man on the ground baled the sacks. The trucks then turned through a space in the forms and backed to the paver.

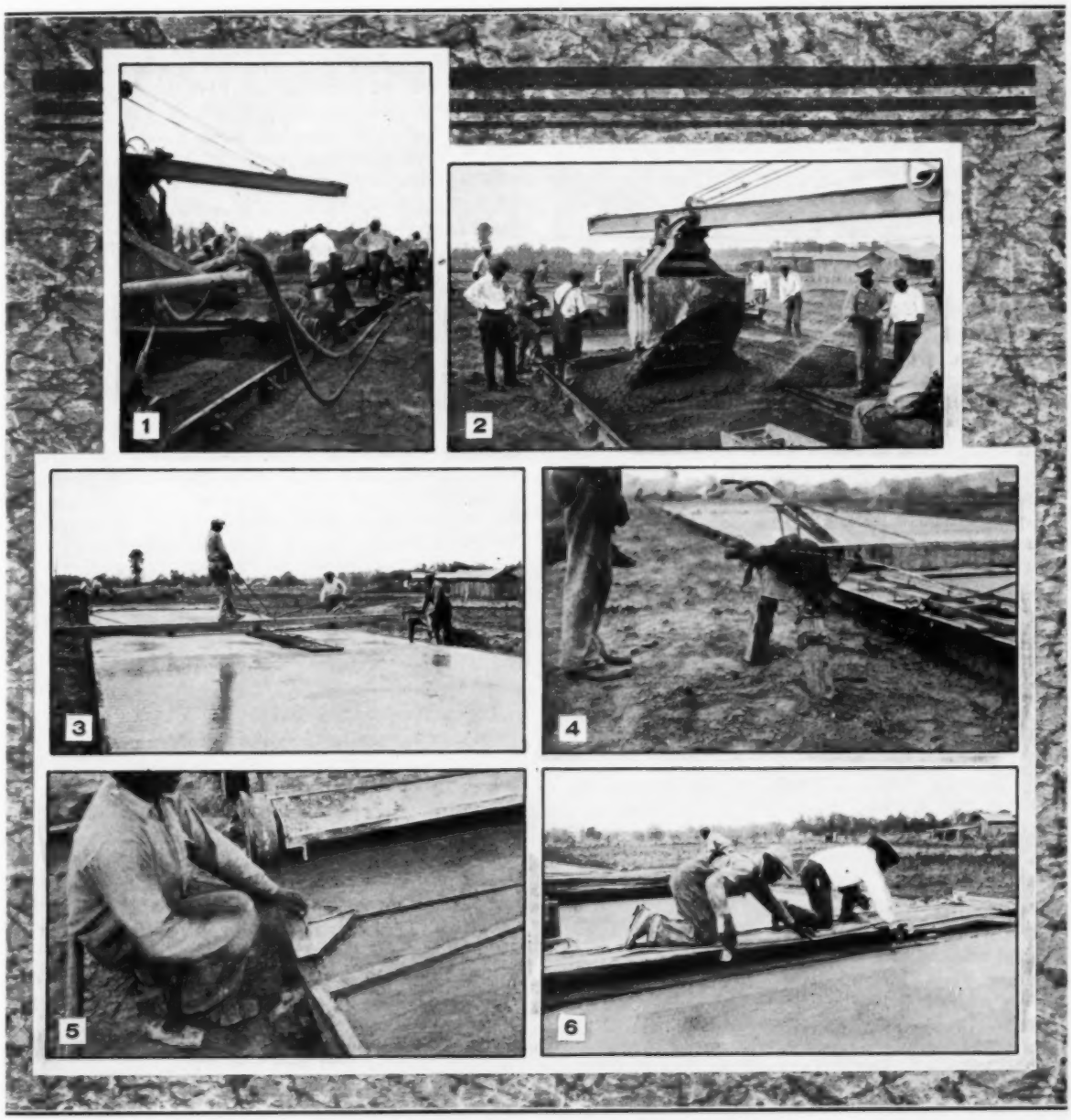
The Concreting Organization

Not much new so far, you say, but watch out and you will be popping before long. By the way did you notice the way the batch trucks alternately backed and drove forward under the batching plant? If more contractors left a couple of extra feet behind the batchers so that trucks could do this there would be less energy wasted at the mixer, beating the skip with a sledge to loosen the cement that adheres to the damp portion. And further, you would be fulfilling the state

specifications more accurately, and after all that is what a contract is, for when the skip is pounded every few batches to loosen the cement the lucky batch gets more than its share of cement and those immediately ahead have been lean. No one would consider cheating intentionally on the amount of cement in a batch but how many times are batches alternately lean and fat because of pure carelessness?

One boy just ahead of the mixer used an 8-inch whitewash brush with a bucket of oil to oil the forms. Then the truck dumper speeded the trucks up to the skip, dumped the batches and sent them away in a hurry. The Koehring 27-E paver had a Carr push grader as well as a Carr trail grader. The push grader weighed 4,500 pounds and carried staggered blades so that the excess dirt was left in windrows. It is heavy enough to be used as a subgrader if the contractor so desires and was equipped with eye bolts for a cable for pulling. The dirt was not removed from behind the push grader but five men were used to handle the push template that was carried just behind the trail grader and to shovel the dirt from the trail grader and to sprinkle the grade.

Two men set the Concrete Steel Co. center steel which measured 10 feet long and 5½ inches high. It was set with 4-foot dowels in pins on 5-foot centers through



SCENES AMONG THE CONCRETING AND FINISHING CREWS

1. The ring for holding the paver hose. 2. Sprinkling the grade as the paver operator spread a batch of concrete. 3. The longitudinal float as specified and used in Louisiana. 4. The adjustable legs of the longitudinal float bridge. 5. The device for lining up the transverse dummy joints. 6. Pulling and finishing a dummy joint.

The Coffee Boy

the center steel. The paver operator spread the batches neatly after the one-minute mix and at the end of each day, with a helper, greased and oiled the mixer and washed out the drum. The oil in the mixer was changed after each 40 hours of operation. The same schedule was used on the tractors and a 50-hour period on the Waukesha motors of the draglines. The paver ran 10 hours per day and produced about 400 batches, each laying about 3.3 feet of pavement or an average day's run of about 1,320 feet. It was noted that there was a minimum of spillage of concrete over the edge of the forms in spreading it by the paver and in spading or finishing. A few drops here and there were all that could be noted. Quite in contrast with some we have seen where every 50 to 75 feet might account for the large part of a yard of concrete carelessly slopped over by the mixer operator or the puddlers.

There were three concrete spreaders, one of whom shoveled to the strike-off of the Ord finishing machine. There was an operator for the 2-screed finishing machine who had no other duties. The machine was equipped with a LeRoi 4-cylinder engine. The finishing machine pulled a 4-wheel bridge which carried all the dummy joint equipment.

The contractor developed a handy device for the use of the men handling the dirt from the trail grader. It resembled in miniature a spreader plow as is used in railroad work for making fills. It consisted of a plate which was bent to fit over the forms and then a wing that fitted snug to the forms and cleaned the dirt out neatly so that it could be readily shoveled up without digging into the grade with the flat shovels. The hand plow had a 3-foot handle of a bent 5/8-inch rod. The drag template which these same men used to check the grade before the center steel was placed was made up of a 6-inch channel iron with a 3/16-inch plate riveted to the leg that was turned down. This plate carried a 2 x 2-inch angle iron with slotted holes and bolts on 1-foot centers so that the template could be adjusted to different state specifications or the changing specifications of any one state. For the setting of the center steel accurately about the simplest device we have seen was used. It consisted of a 1½-inch pipe slotted at the outer end to fit over the steel forms and with a slit at the inner end to drop over the center steel and set it at the proper distance from the forms.

Look out, they are coming thick and fast now! All one had to do was to walk around the paver and along the concrete work and there were new ideas jumping up to be recorded. A horizontal section of 2½-inch pipe with a strap iron diagonal support carried a ring for the paver hose and the sprinkling hose so that they were always clear of the crawlers when moving and never got mixed up in the push grader. The center steel and the dowels were carried in a box on the Carr push grader out of the way and yet handy for the steel man. The contractor used Boss steam hose couplings for the water line and extra heavy 1½-inch Condor contractor's hose made by the Manhattan Rubber Co. The paver carried 200 feet of paver hose and 50 feet of 1-inch hose for sprinkling the subgrade and washing out the paver.

FINISHING THE SLAB

Immediately after the finishing machine had made its second trip over the concrete the trailer behind the machine was unlimbered and two men set the dummy joint every 40 feet. Two steel strips ¼-inch thick, 2 inches deep and 8 feet 11 inches long were used to make the dummy joint. These were made into one long strip by a center cap about 8 inches long and were set with a special device that the Superintendent developed. It consisted of a plate that fitted close to the forms. At the top and in a horizontal plane was a pair of triangular plates with a slot between them into which the steel strips were inserted. Thus when the placing device was set the strips were held in line and trued with a right triangle of wood laid on the top of the slab. The steel strips were pressed and hammered into the concrete and remained there until the finishing was completed.

The next operation in finishing was the use of the longitudinal float, a device originally used in North Carolina. It consists of a wood strip float 12 feet long and 18 inches wide with a 16-inch bearing surface pulled underneath a bridge to one side by one man and then back by a second man. This takes the place of the now common "bull float." The bridge beneath which this float was pulled is worthy of special mention as it had adjustable legs at each end and two ⅜-inch truss rods to strengthen it. The legs consisted of 2 x 4's with iron straps around them and including a second 2 x 4. Each section of the leg and the strap had holes drilled at equal distances so that bolts could be run through and the legs adjusted to different lengths. Thus if one side of the road were higher than the other, the bridge could still be level for the convenience of the men.

Following the longitudinal float, a wood belt or transverse float 29 inches wide and 20 feet long was run across the 18-foot slab. It was equipped with plow handles at either side for convenience of operation. The

slab was then straight-edged with a 10-foot drag straight-edge from the center line to the edge and floated with a 10-foot hand float. After this the slab was checked with a Heltzel 10-foot aluminum straight-edge and finally belted with a 12-inch rubber fabric 5-ply belt which was held taut by a wooden bow support to which the handles were attached. The two finishers ran the edges, pulled the dummy joint steel and used the straight-edge on the dummy joints to be sure that they would ride smoothly when the pavement was completed. Lastly these men placed the burlap. The burlap was carried on a 4-wheel Carr rolling bridge and was wet down before being placed on the bridge and rolled ahead for spreading. Another Carr bridge was used by the finishers when pulling the dummy joint steel. In all there were six men between the finishing machine and the placing of the burlap, including the latter operation.

The burlap was kept on the slab for 24 hours and kept wet the full time. As the summer nights were likely to be very dry the pump was kept in operation the full time and one or two men used to sprinkle the burlap day and night. One pump man was on from 10 A. M. to 10 P. M. and a second from 4 A. M. to 10 A. M. This latter man then acted as an extra man on the burlap and picking up the tools. The contractor used two No. 11 C. H. & E. triplex pumps on the water line as at some times it was necessary to pump unusually long distances. He used 6 miles of 2½-inch and 2 miles of 2-inch oil-field extra-heavy tubing for the water line. The taps for the paver hose were placed every 300 feet and the paver carried 200 feet of hose.

CURING

The burlap was turned back from each dummy joint in the morning and the joints poured with a hand pouring pot, using a special prepared asphaltic joint material made in Louisiana. For the first 1½ miles of concrete the contractor used sodium silicate as permitted in the alternate specifications. After that he used damp earth curing which was sprinkled for 10 days.

The curing gang consisted of seven shovel men and a foreman and one man on the Caterpillar 2-ton tractor which pulled the hillside plow and the scraper. The use of a hillside plow is rather novel in this work but has distinct advantages. It is built with an unusually long wing which can be unlatched and turned over quickly to throw the earth to the other side. Thus the plow can be always set to throw the dirt toward the edge of the slab, no matter in which direction the plow is going.

MISCELLANEOUS ITEMS

There are always a number of operations and methods or equipment that the contractor uses that cannot be easily classified so we are taking these paragraphs to list them and their usefulness. In the afternoon after the team had brought up all the forms used in the previous day's run the driver took the team down the entire length of the work and picked up all the tools that had been dropped by the different labor gangs during the day. It is amazing the collection that is brought in on some days. This salvaging of tools before nightfall well pays for the half day of the team and driver.

The contractor carried six 8,000-candle-power Oxweld-Acetylene carbic lights to permit night work on the job if necessary. This included finishing if unusual conditions required it, repairs to any of the machines and in one instance considerable work in removing the paver from a muck hole. The ground was as hard as anyone could ask in the morning when the work started, but the constant pounding of the batch trucks over this particular section brought up the water and when the paver hit it the crawlers mired like a flash. It required considerable night work to pull it out and then the carbic lights were a blessing.

A Ford truck with a dump body was used as a utility unit for hauling gas and oil to the paver and the tractors. It carried a number of 5 and 10-gallon cans of gasoline and oil. This was for supplementary service as a Standard Oil Co. of Louisiana tank truck gassed every piece of equipment at daybreak before the work started.

One other rather unusual piece of equipment on the work was a 5 x 5½ portable gasoline driven Ingersoll-Rand compressor. This was a handy tool in breaking out old culverts, bridges, and head-walls and also was used in dressing exposed faces of concrete culverts.

THE CURING OPERATIONS

1. *Spreading the burlap.* 2. *Spreading and sprinkling the earth cover.*

After the culverts were built the compressor with air tampers was used to consolidate the filling next to concrete walls. Then there are any number of useful things this tool does in the shop,—operating spray paint gun, riveting, drilling, etc.

There were no expansion joints on this job as the specifications did not permit their use but the state required header boards whenever the paver was shut down for any reason during the day and at the close of work. A temporary header board 2 inches thick and with slots for 8 dowel pins ¾-inch in diameter was carried along near the paver. At the end of each day's run a header, 4 inches thick and similar in construction to the temporary header, was used.

On shoulders, in finishing up the job, the contractor used a Caterpillar Sixty with a 12-foot blade grader and the 6-foot Atlas rotary scraper. Where it was necessary to get dirt at some distance from the slab to make up the shoulder the dragline was used, loading to two trucks. In all, the contractor operated on this job two Caterpillar Sixties, two Caterpillar 2-ton tractors and one Thirty. Of considerable importance to the comfort of the men were the two water boys who covered the entire job. Another item which might occur in some other state but which is distinctly Louisiana in color was the coffee boy. A negro from the Bahamas liked his coffee twice a day and was provided with two pounds a week by the contractor. He made a pot of coffee with an infinitesimal fire and a couple of stones for a rest and the entire group of state inspectors also enjoyed the treat.

The final operation was the erection of right-of-way fence the entire length of the job. The contractor was awarded a certain sum per foot for the fence and its erection but the combination of arrangements with the various property owners would fill a book in itself. The standard fence which the contractor erected when there were no special arrangements was a 26-inch hog wire fence at the bottom with a 3-barbed wire top. The post were required to have as much area as a 4 x 6 and be 6½ feet long and be dipped in tar for the lower 2½ feet. The fence which the contractor erected was well-lined up and taut.

PERSONNEL

The contractor for this 17.4-mile concrete paving project with an 18-foot 8-6-8-inch slab was the Dunn Construction Co. of Birmingham, Ala., for which E. A. Hoffpauir, Vice President, was active in the field and for which C. H. King was Superintendent. For the Louisiana State Highway Commission, R. H. Vaughan was Resident Engineer.

The October issue of CONTRACTORS AND ENGINEERS MONTHLY *will carry a particularly interesting and informative article describing the construction of one of the two new activated sludge sewage treatment plants for Lancaster, Pa., a job which offered unusual and difficult problems in the heavy excavation necessary before actual construction of the plants could begin. Another article describing unusual methods of construction is the story on the paving of 3.88 miles of concrete road through blow sand along the shore of Lake Michigan north of Ludington, Mich.*

Grading on the Roadway to the San Gabriel Dam in California

Building the San Gabriel Canyon Road

THE contract for grading the 2.2 miles of high-line road from San Gabriel camp to connect with an existing low-level road up the west fork of the canyon to replace one in the canyon course which will be covered up by water when San Gabriel Dam No. 1 is completed was awarded to J. E. Haddock, Ltd., of Pasadena, Calif. The contract called for 358,000 yards of roadway excavation and was awarded on a bid of $138,119. Operations were started on February 13, 1933 and were completed early in August. The contractor worked two and three shifts on the job, operating on a 30-hour week, and with a labor crew of 125 men and a Lorain 75-B power shovel.

This road is part of the construction made necessary by the creation of San Gabriel Dams Nos. 1 and 2, the latter being 7 miles above the former, which are being built for the Los Angeles County Water Supply.

A Study of Shrinkage Cracking on a Concrete Road in Ohio

THIS report describes an investigation, made by H. P. Chapman, Chief Engineer, and R. C. Sloane, Research Engineer, Ohio Highway Department, into the causes for the radically different influences of two different cements upon the formation of early shrinkage cracks and a method used for correcting the bad condition in the case of the cement showing the poor results. Numerous shrinkage cracks developed in the concrete containing Cement A, while none were apparent in the concrete in which Cement B was used.

A peculiar condition under which the cracking occurred in the case of Cement A was an early partial initial set, followed by a 30 to 45-minute dormant period, after which the setting proceeded rapidly. It was apparent from the chemical analyses that differences in the constitution of the two cements could not account for their different behavior. However, the appearance of the two cements under a microscope was radically different. Extreme unevenness of grinding in the Cement A was apparent while Cement B which produced no shrinkage cracks showed uniform grinding. The cement A looked more like a mixture of super-cements with relatively coarsely ground cement, a condition which is favorable to the rapid hydration and setting of the extreme fines with a lag in the hydration and setting of the coarser particles. It was found that the early shrinkage with cement A could be prevented by the admixture of calcium chloride, this salt causing acceleration in hydration.

This report, copies of which may be secured from the Highway Research Information Bureau, 2101 Constitution Ave., Washington, D. C., also includes other information.

Stream Diversion *and* Dike Construction *via* Belt Conveyor

H. E. Culbertson Co., of Cleveland, Ohio, Created New 100-Acre Waste Dump for Diamond Alkali Co.

THE increasing production of the Diamond Alkali Co. at its plant at Fairport Harbor, north of Painesville, Ohio, necessitated a new waste dump. In order to create this economically, the channel of Grand River was diverted and a dike thrown up enclosing a 100-acre basin into which the wastes can be pumped. A contract was awarded to the H. E. Culbertson Co., of Cleveland, Ohio, for the diversion and dike construction, this contractor having had experience with levee construction on the Mississippi River through its subsidiary company, the Dixie Construction Co., which used draglines and belt conveyors in that work. This led to the use of similar equipment on the Diamond Alkali Co. job with certain improvements in the equipment itself and in manipulation.

The contract called for the moving of about 425,000 cubic yards of material from the new river channel to build a dike but as the material excavated was greater than the amount needed for the dike there was a large yardage of spoil which made it possible to waste such material as was not entirely desirable for the dike. The new river channel is 3,700 feet long and from 180 to 205 feet wide and from 10 to 14 feet deep. The material excavated ran through the gamut of loam, clay, shale and muck. The dike was about 6,500 feet long with a 12-foot top and a 1 to 1½ slope on both sides, giving a dike varying from 28 to 30 feet high.

The work was started in the late fall of 1932 and completed in the summer of 1933. The first work was the excavation of the river diversion channel starting at a point near the plant and working west. About 150 feet of ground was left between the old channel and the new as a dam during the construction of the dike. Later this was removed by a Northwest dragline loading to trucks and used to fill the old river channel and divert its flow to the new channel. All other material on the contract was handled by the belt conveyor system loaded by a dragline and delivered direct to the dike which was topped off with another dragline.

Moving Dirt from Ditch to Dike

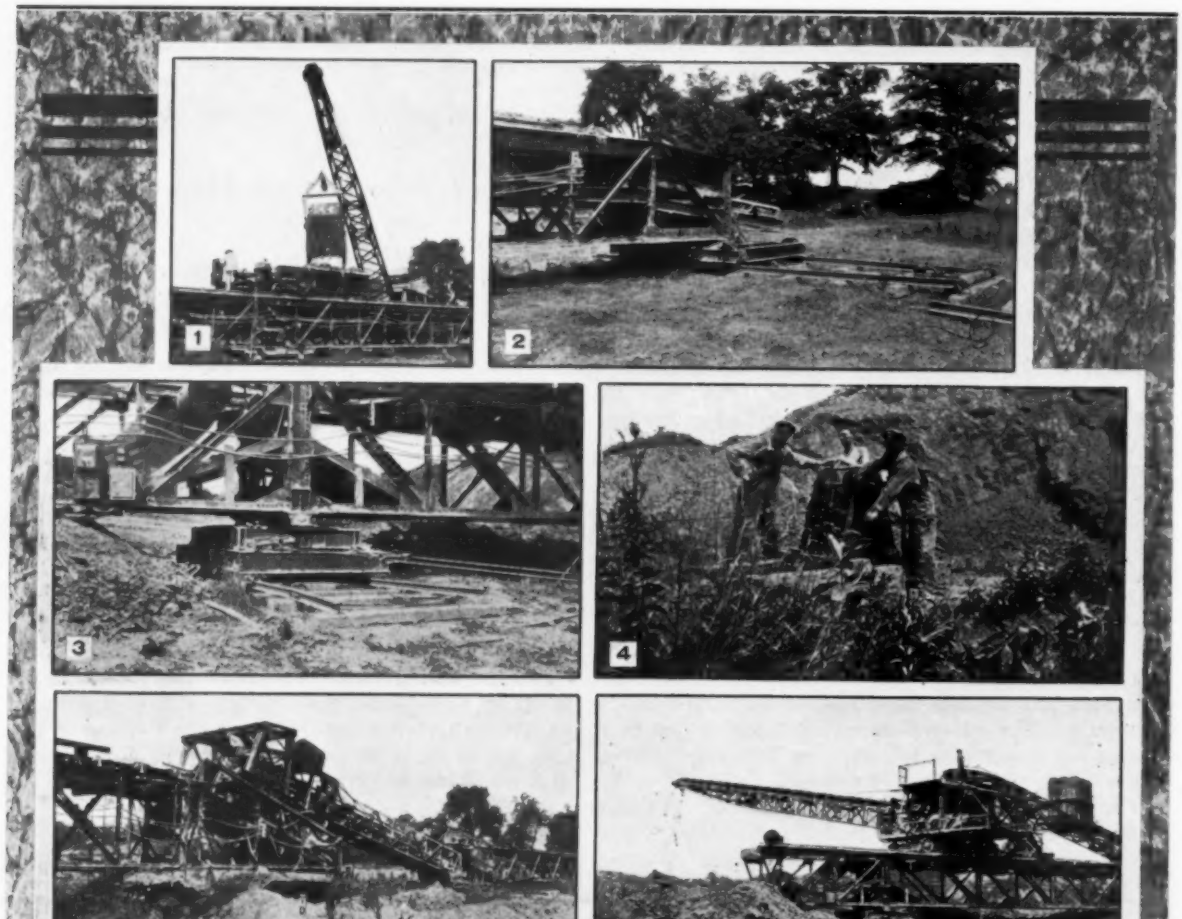
As the hauling conditions were generally poor, and

The Complete Belt Conveyor System and Draglines

even worse during the winter and spring. the use of trucks or even crawler wagons would have been difficult during long periods. When the work started there was about 8 or 9 feet of dry material on top but this petered out to about one foot as the end of the dike was reached near a pool.

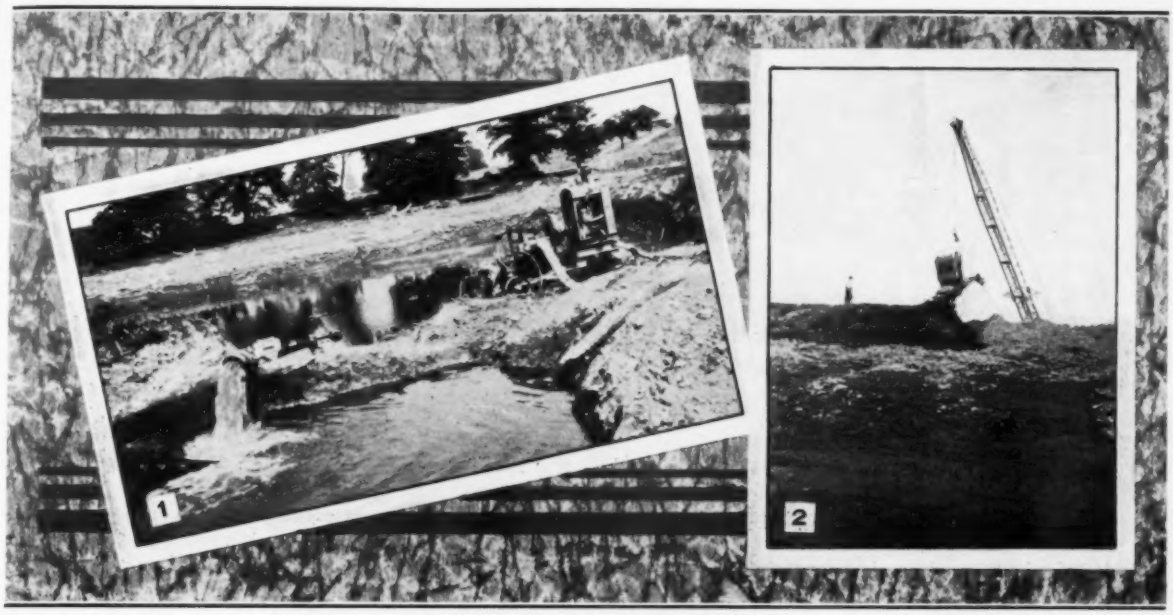
The new channel for Grand River was the borrow pit for the dike but it was definite in location. The fact that there was more material in the channel section than in the dike was fortunate as it is necessary to select carefully the material that is to be used for a dike or levee. In this case the dike was to hold material within rather than protect land from inundation as is the case with levees. The placing unit, or stacker boom, of the conveyor system proved its usefulness in this case not only to place the material in approximate position in the dike to build it uniformly, but it could be swung to the back of the dike whenever the material being placed in the loading hopper was mucky and thus maintain a uniform section of firm stable material in the dike section.

There were two distinct units in the belt conveyor system which were operated separately. First, there were the main delivery conveyors consisting of two bridges or trusses each 120 feet long, operating as a unit, carrying the 42-inch belt. These sections were mounted on trucks at the two ends with a common truck where they met. The trucks had four wheels running on railway tracks so that the conveyors could be moved laterally. A crew of four track men worked constantly, setting the track on sleepers ahead of the conveyor and moving the conveyors as needed. Block and tackle were used for pulling the conveyors laterally with a Cletrac 20 crawler tractor or by hand winches set 75 feet ahead of the conveyors. In order to support the heavy load of the feeder which ran on rails along the top of the main delivery conveyors these were supported at the one-third points with cribs of railroad ties. This lessened the loads on the tracks which was particularly necessary because of the soft nature of the



DETAILS OF THE BELT CONVEYOR SYSTEM FOR HANDLING DIRT FROM THE CHANNEL TO THE DIKE

1. The dragline loading the feeder hopper. 2. The end of the main delivery conveyors showing the supporting truck rails and block for moving. 3. The center truck of the main delivery conveyors. 4. One of the hand winches for moving the spreader bridge. 5. The inclined transfer belt from the delivery bridge to the stacker bridge. 6. The stacker boom wasting wet material back of the dike.



DRAINAGE AND TOPPING OFF

1. The 6-inch centrifugal and the 4-inch double diaphragm pumps which were used for draining the pit during excavation. 2. The end of the 80-foot boom of the dragline which cleaned up one side of the channel section and topped off the dike.

ground. These conveyors were moved about 25 feet at a time while the other section which carried the stacker or spreader boom moved about 5 feet at a time as the levee was built. The move of 25 feet was decided upon as that was the effective operating distance of the dragline that loaded the material from the ditch into the feeder.

The second section of the conveyor system received the material from an inclined transfer belt which was operated separately from the initial delivery belt system. The transfer belt was 60 feet long and delivered the material into the hopper at the end of the second bridge. This bridge carried a tripper on top and also the stacker or spreader which placed the material wherever desired on the dike. The spreader and tripper were connected so that they could run as a unit back and forth on the bridge, giving a greater operating radius to the system. The bridge was 175 feet long and the spreader boom 75 feet long.

The entire Link-Belt conveyor system was operated at 450 feet per minute with the exception of the spreader which ran 600 feet per minute as insurance against material piling up on this belt. The belts were all driven by electric motors and controlled by a master switch at the operator's platform on the stacker. Push button emergency stopping switches were located on each belt so that they might be stopped instantly. As soon as any trouble was eliminated and the switches reset for starting, the master switch became operative and when pushed started the various belts in succession, beginning with the spreader so that there would be no piling up of the material.

The operating crew for the conveyors consisted of one man on the feeder hopper on top of the delivery bridge who could control the speed of the feeder belt and who also watched for stumps and other material which might damage the belts and which were undesirable in the dike section. There was a man at the inclined transfer belt who was needed particularly when the belts were handling muck which ran around the pulleys and caused trouble. He frequently had to use a long-handled spade to remove sticky material that piled up under the belt. On the bridge carrying the tripper and spreader there were two men, the master operator and one man watching the tripper for the sticking of the material.

Dragline Operation

A Link-Belt K-48 dragline with a 40-foot boom and a 2-yard Omaha dragline bucket did all the digging of the diversion channel, loading direct to the feeder hopper on the first bridge. A Bucyrus-Erie 52-B dragline with an Atlas diesel engine and an 80-foot Duralumin boom worked a 2¼-yard Bucyrus-Erie dragline bucket for digging on the dike side to finish the channel section and also for topping off the dike as mentioned before. This dragline worked two 10-hour shifts while the remainder of the job worked one 11-hour shift from 6 A.M. to 5.30 P.M. with one-half hour for lunch. At the other end of the job the Northwest dragline worked on closing the final gap in the old river channel and building the river end of the dike.

Other Equipment and Methods

Electric power for conveyors and the pumps was purchased by the contractor from the Diamond Alkali Co. and was carried over the ground in 3-phase heavily-insulated rubber-covered cables. In order to maintain the pit in as dry a condition as possible for the sake of efficient dragline operation and belt operation the contractor used two pumps, one 6-inch Lecourtenay centrifugal and the other a Barnes 4-inch double diaphragm pump.

A Milburn oxyacetylene welding outfit was main-

The Stacker Boom Delivering a Stream of Dry Material to the Dikes

tained on the job at all times for both minor and major repairs to the equipment. For efficient operation of the Bucyrus-Erie dragline on the night shift two Oxweld carbic lights were mounted on the platform in front of the runner and a third was used to throw a light over the general area of operation.

A tool shed mounted on skids contained all the tools necessary for minor repairs and adjustments on the equipment as well as extra wire cable and other needed spares. It was pulled along close to the belt conveyors by the crawler tractor. Two tank wagons were used by the contractor to maintain a supply of gasoline and fuel oil for the draglines. These were filled in town and hauled out to the job by a truck of the local distributor and then spotted near the equipment by the crawler tractor.

A greaser was maintained to look after all the equipment. He made two rounds each day to grease the head and tail pulleys of the belt conveyors and packed the idlers about once a month.

PERSONNEL

This work was done under the direction of Fred G. Volk, Civil Engineer, Diamond Alkali Co. Harold E. Craig was Superintendent in charge of the operations of the H. E. Culbertson Co. of Cleveland, Ohio.

The Highway Contractors' Code

Supplemental to the Construction Industry Basic Code

THE American Road Builders' Association, as an Association embracing all highway divisional activities and comprising a complete cross-section of the entire highway industry, has submitted to the NRA the following Highway Construction Industry Code supplemental to the Construction Industry Basic Code and covering all phases of the highway industry.

THE CODE AS SUBMITTED

The Highway Construction Industry, as hereinafter defined, subscribes to the provisions of the "Code of Fair Competition for the Construction Industry," and, in accordance with Section 8 thereof, submits the following supplemental code prepared and proposed by the American Road Builders' Association on behalf of the Highway Construction Industry.

Declaration—The American Road Builders' Association the membership of which is comprised of official, professional, and trade units of the highway industry, imposes no inequitable restrictions on admission to membership, and is truly representative as a national organization of the Highway Construction Industry as a whole.

Purpose—This supplemental code for the Highway Construction Industry, as a major sub-division and integral part of the general Construction Industry, is established to further the stated purposes of Title I of the National Industrial Recovery Act by providing for the cooperation of this division of the Construction Industry with the President of the United States to induce and maintain the united action of all elements of the Highway Construction Industry under adequate governmental supervision, to eliminate unfair competitive practices, to reduce and relieve unemployment, to improve standards of labor and living, and otherwise to rehabilitate and stabilize the Highway Construction Industry.

Definition—The term "Highway Construction Industry," as used herein, embraces the design, construction and maintenance of roads and streets and is defined to mean the designing, the constructing, and the assembling, installing and applying of manufactured parts and products, and the supplying of materials of roads and streets and other fixed improvements and modifications thereof intended for use in highway transportation and communication, and the maintenance of these facilities; the term "Highway Construction Industry," is further defined to include those otherwise unattached national or regional unit groups, manufacturing highway equipment or machinery or producing materials almost exclusively used in highway design, construction and maintenance who elect to come under this code by filing with, and obtaining approval of, the National Recovery Administration for a supplemental code to the Highway Construction Industry Code; and the "Highway Construction Industry" is further defined to include those persons without limitations, who perform duties in connection with the foregoing road and street operations. The term "person" as used herein, is taken to mean a natural person, partnership, company, association, corporation, or agency. The term "employers" shall mean all persons who employ labor in the conduct of any branch of the Highway Construction Industry as defined above. The term "employees" shall mean all persons employed in the conduct of any branch of the Highway Construction Industry, as defined above.

The term "member," as used herein, shall be defined to mean a person, partnership, company, corporation, or association subscribing to membership in the American Road Builders' Association or a state section thereof.

Scope—This is a voluntary code for the Highway Construction Industry, the provisions of which, under the terms of the National Industrial Recovery Act, shall become binding after approval by the President, and shall thereafter be the standards of fair competition for the Highway Construction Industry. All private employers of persons engaged in the Highway Construction Industry shall be required to adhere to the code terms and conditions.

Public employers (such as states, counties, cities, and other political sub-divisions) are exempt from the requirements of this code but may at their option, subscribe to this code by voluntary agreement, whereupon its provisions shall become binding upon such employers. These voluntary agreements when signed by states, counties, cities and other political subdivisions, shall be filed with the National Recovery Administration either direct, or through the National Highway Administrative Committee under this code.

This code for the Highway Construction Industry does not apply to the manufacturing of highway machinery and equipment, or to commercial plant, quarry, and factory production of the basic materials used in highway design, construction and maintenance, except that national or regional organized unit groups, manufacturing equipment or machinery, or producing materials used almost exclusively in the Highway Construction Industry and not embraced by any other code may subscribe to this code for the Highway Construction Industry by a supplemental code hereto subject to approval of the National Recovery Administration.

Minimum Wages—Maximum Hours—Employers in the Highway Construction Industry agree to comply with the minimum rates of pay and maximum hours of work as set forth in the basic construction industry code except that on Federal Aid projects under the National Industrial Recovery Act employers in the highway construction industry agree to comply with the minimum rates of pay for skilled and unskilled labor and the maximum hours of employment for the various classes of employees of each state as may be set forth and pre-determined by the state highway department of that state in accordance with the "Rules and Regulations—Emergency Highway Construction" issued by the Federal Government "Special Board for Public Works" and the "Special Provisions Governing Highway Projects" issued by the Bureau of Public Roads, United States Department of Agriculture and all amendments or additions to these under authority of Section 204 (c) of Title II of the National Industrial Recovery Act.

Nothing herein shall be construed as preventing voluntary agreements establishing a lesser maximum number of hours as provided in the National Industrial Recovery Act.

Cost Reports and Accounts—(a) The Highway Construction Industry agrees to comply with such requirements as may be imposed by the President in respect to submittal of reports and keeping of accounts and to furnish promptly, upon request, certified copies of payrolls.

(b) Funds received by a general contractor for construction work shall be accepted and applied first for the purpose of paying proper costs of making such improvement, including amounts due to employees, material, supply and equipment vendors, sub-contractors and others. This shall not be construed to require a general contractor to keep in separate bank accounts or deposits the funds received under separate contracts, provided that books of account shall clearly show the allocation to each and every contract of the funds deposited in his general or special bank account or accounts.

Wage Payments in Legal Tender—Wages of all skilled and unskilled labor shall be paid in legal tender of the United States, or its equivalent in the form of a bankable check. Employers or their agents shall accept no rebates directly or indirectly on such wages.

Contract Prequalification Requirements—The Highway Construction Industry agrees that highway contractors shall file complete information regarding performance and financial status with the Bureau of Contract Information, Inc., Washington, D. C., or such other agency as may be designated by the National Recovery Administration, and comply fully with prequalification requirements of state highway departments and other official bodies, provided, however, that nothing herein shall be construed to authorize any state, county, city or other political sub-division to require qualifications which would tend to discriminate against the "out of the state" contractor on Federal Aid or other projects upon which federal funds are applied.

Quotations in Writing—All quotations shall be in writing and shall contain a definite statement of price, quantity, terms of payment, time and place of delivery and all other items necessary to form a complete understanding.

Bids Below Cost Prohibited—A contractor shall not knowingly submit a bid or accept a contract which does not include all direct and indirect costs and include a reasonable amount for profit and he shall maintain and keep on file his original estimates supporting his bid or contract.

Rejection of Bids—A contractor shall not revise, or attempt to revise, his bid after bids have been opened in order to improve his position with the owner. Bona fide errors discovered after the opening of bids shall be grounds only for withdrawal of the bid or bids affected. The contractor shall not encourage the owner to reject bids and re-advertise in order that he may revise his original offer.

The foregoing, however, shall not prevent any contractor even though not the lowest bidder from taking a contract providing the award is made at his competitive price, nor shall it prevent a contractor from accepting the award of a contract where no competitive bids are taken.

Bids Confidential—A general contractor shall not, prior to the award of a particular sub-contract, convey to any subcontractor or material vendor any substantial information relating to the bid of any other sub-contractor or material vendor, who has made a bid to him or to any other general contractor, nor shall he mislead, or deceive any sub-contractor or material vendor as to the amounts and conditions of other bids for the purpose of obtaining a lower bid.

Contract Performance—The Highway Construction Industry agrees that the highway contractor shall perform with his own organization and workmen at least 80 per cent of the value of the work embraced in any contract and shall require all subcontractors to conduct work performed by them in accordance with the same provisions of this code as govern his own work.

Payments to Sub-Contractors—Contractors shall pay all sub-contractors, material vendors and others, not less than their proportionate amount of partial payments received on account of a project during the progress of the work, and contractors shall make final payment of the unpaid balance to these persons not later than ten days after the contractor has received final payment from the owner.

Disputes—Contractors shall be ready and willing to settle disputed matters promptly. In cases where no definite plan of settling disputes is prescribed by law, specification or contract, the method of arbitration shall be used. Where arbitration as a method of settling disputes is agreed upon, the rules of procedure as established by the American Arbitration Association shall govern except as otherwise provided by law, specification or mutual agreement. Payments exceeding that sufficient to cover the amounts in dispute shall not be withheld from the parties affected.

Financing—A contractor shall not permit sub-contractors or material vendors on a specific contract to finance or guarantee his accounts.

Prohibited Rebates—Contractors shall not secretly give, or accept rebates, refunds, allowances, unearned discounts or special services to or from sub-contractors, material vendors or others which are not extended under like terms and conditions

to other purchasers of material or services who have equal credit rating.

Contract Payment in Full—A contractor shall not waive his right to receive, in lawful money of the United States or its equivalent, any part of contract payments as they become due, or shall he return to the owner or his agent any part of said contract payments, nor shall he return to the owner or his agent any money, or render him any service or give him anything of value not required by the contract.

No person under this code shall request, accept or give waivers of legal rights from or to parties with whom he is dealing in the execution of the work without first having made or having received just and equitable settlement.

Splitting of Commissions—The splitting of commissions or other compensation received by an employee or agent of the seller, with the buyers for the purpose or with the effect of influencing a sale, shall be deemed an unfair method of competition.

Defamation of Competitor—No person under this code shall defame a competitor by falsely imputing to him dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representation.

Interference in Contracts—No person under this code shall knowingly interfere with any other persons, firm, corporation or association by any means or device whatsoever in any existing contract or order between a seller and purchaser, in or about the production, manufacture, transportation, purchase or sale of any road or street product, or in the performance of any contractual duty or service connected therewith; nor shall any person under this code destroy or appropriate, in whole or in part the patronage, property or business of another engaged in the highway construction industry.

Deceptive Practices—(a) No person under this code shall sell or offer for sale any road or street product with the intention to deceive customers or prospective customers as to quality, quantity, size, grade or substance of such product.

(b) No person under this code shall make or brand any road or street product for the purpose or with the effect of misleading or deceiving a purchaser with respect to quality, quantity, size, grade or substance of the materials purchased.

Convict Labor Prohibited—No person under this code shall employ penal labor, nor knowingly use materials produced by penal labor.

Enticement of Employees—Interference with a competitor's business through the employment or enticement of his employees from employment shall be deemed an unfair method of competition.

Accident Prevention—Every employer shall lend his cooperation and active support toward reduction of accidents in the conduct of his operations.

No employer shall be permitted to expose his employees unnecessarily to dangerous working hazards. Cases of flagrant disregard of the life and health of employees shall constitute a violation of this code.

Credit Terms and Purchasing Equipment Practices—The National Highway Administrative Committee under this code shall be empowered to collaborate with the appropriate agencies under this and other codes to formulate:

1. Credit terms for highway equipment and materials.
2. Fair purchasing equipment practices.

Such credit terms and purchasing equipment practices which shall be uniform within states or regional limits as may be approved by the National Highway Administrative Committee, shall be recommended to the NRA for concurrent inclusion as a part of this code and such other codes as may be affected thereby.

Supplemental Codes—It is intended that this supplemental code for the Highway Construction Industry may be amplified and expanded by additional supplemental codes prepared and proposed by trade or industrial associations or professional bodies within the "Highway Construction Industry," representative of national or regional organized unit groups having special conditions or trade problems. Such supplemental codes shall, so far as possible and subject to the general approval of the National Recovery Administration, be administered by administrative committees or agencies therein respectively established.

Such administrative committees so established shall have all the authority and power under this code as granted to administrative committees of supplemental codes under the general Construction Industry Code as prescribed by Section 8 of the Code of Fair Competition for the Construction Industry except that the "National Highway Administrative Committee" shall be substituted for the "National Administrative Committee" under the said Section 8.

National or regional organized unit groups engaged in the manufacturing of equipment or machinery or production of materials used almost exclusively in the Highway Construction Industry and not embraced by any other code, agreement or license provision under the National Recovery Administration shall likewise be eligible to prepare and propose additional supplemental codes to the supplemental Highway Construction Industry Code as provided in this section subject to the approval of the National Recovery Administration.

General Provisions—This supplemental code to the Construction Industry Code will not promote monopolies, or eliminate or oppress small enterprises and will not operate to discriminate against them and will tend to effectuate the policy of said Title I. It is expressly recognized hereby that the President of the United States, may, as a condition of his approval of this code, impose such conditions (including requirements for the making of reports and the keeping of accounts) as may be expedient in the furtherance of the public interest for the protection of consumers, competitors, employees, and others, and may provide such exceptions to and exemptions from the provisions of this code as the President of the United States in his discretion deems necessary to effectuate the policy herein declared.

The Highway Construction Industry agrees to support and patronize establishments operating under codes, agreements or licenses authorized under the National Industrial Recovery Act.

Code Changes—In accordance with Section 10 (b) of Title I of the National Industrial Recovery Act, this code expressly provides that the President of the United States may from time to time cancel or modify any provision in this code.

Amendments or revisions may also be proposed to the National Recovery Administration by any party of interest and when proposed by any person within the Highway Construction Industry such proposals shall be made through the National Highway Administrative Committee under this code.

Relation to General Construction Code—The Highway Construction Industry, by this supplemental code, reserves the right, under the National Industrial Recovery Act, and Section 3 of the Construction Industry Code, to be independent and self-governing in respect to all conditions and problems relating exclusively to highway affairs. The Highway Construction Industry understands and agrees that proposals in respect to matters affecting more than one division or part of the Construction Industry may be initiated by any division and shall be submitted for consideration to the National Administrative Committee under the Construction Industry Code adopted pursuant to the National Industrial Recovery Act and the determination by this Committee shall be final and binding upon all divisions affected thereby except for appeal to the National Recovery Administration.

Administration—To effectuate the purpose of this supplemental code and the National Industrial Recovery Act and to provide for administration within the Highway Construction Industry there is established (1) a "National Highway Administrative Committee" and (2) ten "Regional Highway Administrative Committees."

(1) National Highway Administrative Committee. The National Highway Administrative Committee, hereinafter designated as "national committee," shall be composed of the mem-

bers of the Executive Committee of the American Road Builders' Association as that committee is from time to time constituted; the Chairmen of each of the ten Regional Highway Administrative Committees under this code; one representative from each national or regional organized unit group of the Highway Construction Industry submitting and obtaining approvel of a supplemental code under the Highway Construction Industry Code; and three non-voting members to be appointed by the National Recovery Administration.

The national committee may, from time to time, present to the National Recovery Administration recommendations based on conditions in the industry as they may develop which will tend to effectuate the operation of the provisions of this code and the policy of the National Industrial Recovery Act.

This committee shall be charged with the duty of formulating general rules and regulations necessary for the administration and enforcement of this code and, upon the complaint of any regional committee or other interested party or upon its own initiative, of making such inquiry and investigation as to the operation of this code as may be necessary.

This committee shall also have authority to take such action as may be appropriate to enforce adherence to the code provisions.

Further this committee shall have the authority to establish sub-committees with such delegated powers as it may deem necessary.

This committee, on request of any regional committee or on written request of twenty members under this code, or upon its own initiative, may review decisions or rulings of regional committees and the determination of the national committee shall be binding upon all persons affected thereby except for appeal to the National Administrative Committee under the basic Construction Industry Code, or to the National Recovery Administration.

(2) Regional Committees. Regional Highway Administrative Committees herein designated as "Regional Committees" shall be organized in each of the ten districts or regions into which the United States has been divided by the National Recovery Administration for operation under the National Industrial Recovery Act. Regional Committees shall be elected by the members under this code having their principal offices or places of business within the region and shall consist of such number as the members in each region shall determine, provided, however, that there shall be at least one representative elected to the regional committee from each state within the region. The Regional Highway Administrative Committee shall elect from its membership a Chairman who shall serve for such term as the regional committee shall determine.

Each Regional Committee, subject to the review and control of the National Committee, shall have full authority to make all needful rules and regulations for the administration and enforcement of the provisions of this code within its jurisdiction; and upon the complaint of not less than ten members of this code or upon its own initiative, shall make such inquiry and investigation and take such action as may be necessary for the proper administration of this code within the regions subject to its jurisdiction.

To facilitate the local organization and local enforcement and provide suitable self-determination of local issues within the province of the code and the general rulings of the national committee, each regional committee shall be empowered to establish local, state or regional sub-committees or agencies with such delegated powers within its province, as it may deem necessary.

Participation in the election of state, regional and national representatives and committee members to administer this code or any subsequent revision or addition to the code shall be extended to any person, partnership, or corporation whose principal controlling executives are citizens of the United States, or who have declared their intention of becoming citizens, engaged in the Highway Construction Industry who accepts his share of the cost and responsibility as well as the benefits of such participation by becoming a member of the American Road Builders' Association or a state section thereof.

Administrative Expense—All persons defined in this code shall bear their proportionate share of the expense incident to securing the approval of and administration of this code of fair competition under such rules and regulations as may be approved by the President under Section 10 (a) of Title I of the National Industrial Recovery Act, except that governmental units subscribing to the provisions of this code by voluntary agreement as provided under Section 4, Part II hereof, shall be exempt from all such expenses.

Effective Date—This code shall become effective ten days after its approval by the President of the United States, and shall be applicable to all Highway Construction work undertaken pursuant to contracts entered into or otherwise commenced after such date.

Ice Control on Winter Work

CONTRACTORS carrying on highway, bridge and dirt moving operations this winter will find that it will pay them to provide arrangements for highway safety before winter sets in, as was pointed out in a brief article on this subject in *The Constructor*. With the increase in winter work contracts and with the expectation that there will be a normal amount of freezing weather, icy hills, curves and detours, ice control methods planned in advance will be found to save time, money and possibly lives.

Stockpiles of gravel, sand, cinders and other abrasives can be laid in the vicinity of places where accidents are most likely to occur in slippery weather. Such stockpiles are easier to prepare before freezing weather starts. They can be protected against freezing by alternating thin layers of calcium chloride sprinkled between loads as the piles are built up. Rain and snow water, percolating through the mixture, keeps the pile unfrozen and ready for easy loading, shoveling and spreading. With 100 pounds of calcium chloride used per cubic yard of sand or cinders, the mixture is well prepared for almost instant ice control when it is spread on a slippery, icey pavement.

Frequently, when untreated sand or cinders are spread on ice at curves, grades or intersections, they are brushed off in a few moments. When sand or cinders are treated with calcium chloride before they are spread, their initial action is to melt into the ice; then after the solution thins out, it freezes solidly into the surface, providing an embedded non-skid surface. Should an emergency arise and stockpiles of treated abrasive materials not have been prepared, loads of sand or cinders can be treated with either dry calcium chloride flakes or with a solution, before spreading.

An Analysis and Comparison of Costs of Base Coat Plaster

COPIES of the paper "An Analysis and Comparison of Costs of Base Coat Plaster" which was prepared and presented by Lee S. Trainor, Chief Engineer, National Lime Association, at the Fifteenth Annual Convention of the National Lime Association at Atlantic City, N. J., are now available for interested readers of CONTRACTORS AND ENGINEERS MONTHLY. In preparing this material, Mr. Trainor has approached the subject from a point of view that one cubic yard of plaster mortar would cover the same area and to the same thickness irrespective of the nature of the materials making up the plaster, provided the same type of base was used. The figures developed include lime in three forms, quicklime in lump form and pulverized, and hydrated lime. These figures have been developed covering the lime alone and when gauged with cement, each of these in turn being compared to neat fibered gypsum which is the most prevalent form in which the material is supplied.

Readers who are interested in securing copies of this paper gratis may do so by writing direct to The National Lime Association, 927 15th St., N. W., Washington, D. C.

How the Other Fellow Did It

Ideas That Have Already Proved Helpful to Contractors

Mixing Waterproofing in a Plaster Mixer

255. A novel method of preparing a waterproofing mastic was used by a New York contractor and is equally applicable to other work where a mastic is desired. The subsurface walls of the structure under construction were rendered moisture-proof with 4-ply waterproofing and all plane or horizontal surfaces had a layer of bricks in asphalt mastic. This mastic was mixed in a machine similar to the old style continuous plaster mixers and operated by a ¾-hp motor working on a 220-volt circuit. The asphalt was first melted so that it would flow readily and then heated to a temperature of 450 degrees for mixing the sand and asphalt. 24.6.23.

Handling Steel Fabric for Road Reinforcement

256. A method of handling steel fabric which has only been seen on two of the many jobs visited was used by a New Jersey contractor. Many contractors unload the fabric as soon as it arrives and stock it in the batcher yard or somewhere else until needed out on the job. They they are usually strung out piece by piece as needed for each mile or two. This contractor moved his steel direct to the job from the cars by truck loads, stacking the whole loads at proper intervals. Then as the paver approached, the fine grade crew strung out the steel along the shoulder ready for the steel setters. This minimized the handling of the steel and it was always ready ahead when needed and one handling was done away with completely. 24.6.30.

Improving the Appearance of Dump Trucks

257. To minimize the splashing of body, cab and running board of light trucks, particularly those with dual rear tire equipment, light weight fenders which have proved very practical have been developed by the West Virginia State Road Commission. These fenders, which are illustrated in the accompanying photograph, were built and attached at the district repair shop at a very nominal cost.

A sheet metal strip of 12-gage material of suitable length and width is cut out to such shape that the horizontal portion projects 6 inches or more from the side of the dump body to extend beyond the outside edge of the outer dual tire. The inclined portion of the fender is formed about the corner of the body, whether square or rounded, and entirely closes the space ahead of the rear wheels and outside the main frame of the body. The horizontal length of the fender is welded to a light steel angle, 2 x 2 x ¼-inch, which in turn is welded or bolted to the side of the body above the wheels. If bolted, button head bolts are used with the heads inside the body. The inclined front portion of the fender is carried by an iron strap attached to one of the steel sills and the upper edge which projects underneath the bed may be welded to the steel bottom. A slot is cut in the inclined face in such position that the tail gate trip-rod may be inserted through this hole and be properly controlled. The exposed corners of the fender are rounded.

A Front View of the Fender, Showing the Method of Attachment to the Body and Insertion of the Tail-Gate Trip Rod

This body-attached fender does not interfere with the operation of the dump body and hoist, nor does it handicap the loading of material. While light in weight, it is sufficiently rigid to retain its shape under all ordinary operating conditions and to perform its intended functions in a suitable manner. When workmen are transported in the truck, a trip over wet or muddy surfaces is made more comfortable. The forming and attaching are of such simplicity that the fenders are quite inexpensive and their cost is offset by the saving of truck cleaning which otherwise would be needed more frequently to maintain a presentable appearance. J. R. M. 7.33

Building a Retaining Wall Upside Down

258. Using a retaining wall as a substitute for underpinning was a novel procedure of a New York subway contractor. This was done in a section built up with tenements which were so old that the contractor felt it advisable to retain the soil that supported the building footings rather than underpin the structures directly. The retaining wall was built in 3-foot lifts from the top to the bottom coincident with the excavation of the subway trench to a total depth of 12 feet. In this manner the contractor prevented any opportunity for damage suits due to even microscopic settlement of the adjacent buildings, some of which might have been seriously damaged by even very small amounts of settlement. 24.6.22.

Dumping Traps for Bulk Cement

259. A light-weight dumping trap which could be quickly made to replace one which might be broken was developed by an Iowa contractor. A pair of tracks made from old Ford frames was laid at the entrance to each trap with the outer flanges spread to make the entrance of the cart wheels easier. The outer ends of the tracks were bent to the same radius as the cart wheels so that they stopped the wheels as the carts were wheeled into the traps. The traps were made of well-braced frames of 2 x 2-inch planed stock and covered with canvas. To protect the canvas from excessive wear, the back of the trap against which the cement was dumped was protected with a sheet of galvanized iron. The base of the trap was hinged to the platform or dock about 8 inches from the edge so that when the trap was down the platform provided support for the trap which did not have to rest on the batch truck body. Further support was provided by counterbalance cords which were knotted and a nail put through the knot at a point where the nail would hit the pulley in the frame overhead and stop the trap at the right point. The weights were two cans of gravel for each trap and the sash cords were regulated in length so that the cans rested on the dock when the traps were raised the proper amount. This arrangement gave the men practically nothing to look after except the actual dumping of the cement. 24.4.34

Moving 20,000 Yards

of

Trap Rock

Waterbury Concrete Construction Co.

Blasted Out Cut-Off

in Central Nyack, N. Y.

ON New York State Route 59, the Nyack-Suffern Turnpike, about 2 miles west of Nyack-on-Hudson, in the village of Central Nyack there has been for many years a very bad double curve on a steep grade that has resulted in accidents with increasing frequency. Late in 1931 there was awarded to the Waterbury Concrete Construction Co. of Suffern, N. Y., a contract for the removal of this S-curve by blasting a way through an outcropping of trap rock. The work also included the filling of a long stretch of swamp adjacent to the old road with the stone from the cut. The water main supplying the villages of Nyack, Central Nyack, Upper Nyack and South Nyack ran along the south side of the old road so that explosives could not be used to blast out the mat of roots to permit the new rock fill to settle rapidly.

Drilling at the Maximum Depth of the Cut

The Rock Cut

Work on the 20,000-yard rock cut was started on September 16, 1931, with the setting up of the very complete compressor plant and the stripping of the small amount of earth over the rock at the west end of the work. The compressor plant consisted of three 220-foot and one smaller portable I-R compressors delivering air at 100 pounds pressure to an equalizer and thence through 2-inch pipe to a manifold at the heading where a series of ¾-inch connections with individual valves permitted the use of as many as seven jack hammers at one time. Two I-R drifters were used at the base of the cut with 20-foot lengths of drill steel. An oil furnace and a No. 50 I-R drill steel sharpener completed the equipment in the blacksmith shop located alongside the main road.

Work was shut down on December 31, 1931 and not started up again until March 1, 1932. During this time most of the work on the removal of the water main was completed so that the accumulated rock could be moved from the cut to the fill in the swamp. All of the loading of the rock in the cut was handled by a P & H 1¼-yard shovel loading to two Linn tractors,

as long as the fill was used on new right-of-way and there was no traveling on the public right-of-way. After the adjacent shallow fill was completed four or five trucks moved the rock on the longer hauls which ran as much as 2 miles. Rock excavation was completed about May 15, 1932.

The rock cut which was about 200 feet long reached a maximum depth of 24 feet, was 42 feet wide at the bottom and trimmed back on a 1 to 4 slope to the top.

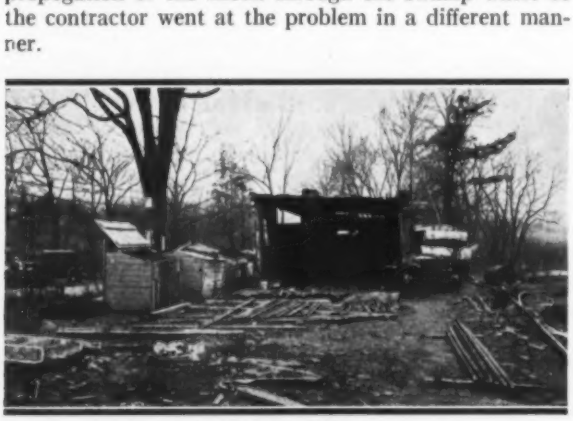
DRILLING PROCEDURE

The two drifters drilled from 10 to 12 holes across the face at the foot of the cut to uniform depths of 20 feet. The holes were first sprung with four sticks of du Pont or Hercules 60 per cent dynamite and then the charges worked up to about 15 to 20 sticks as needed. For the blasting of the face from 50 to 140 sticks were used per hole. These major blasts were fired about once a week during the work. The holes were fired with a du Pont 50-cap battery. The holes were cleared of stone dust before charging with a 22-foot length of ¼ or ½-inch pipe attached by an air hose to one of the pipes at the manifold. During some of the cold weather during the spring a small wood fire was kept going at the manifold to prevent accumulations of moisture from freezing at the valves.

The vertical holes at the top of the face and all blockholing was done with jack hammers. Eight-foot steel was used for the vertical holes starting with 2-foot lengths. The organization for the drilling crews consisted of one blacksmith and one helper, two drifters with one helper each, one steel carrier, one blaster, an operator for the P & H 1¼-yard shovel and the required number of jack hammer operators.

HANDLING FILL ON THE SWAMP

On the north side of the old road across the swamp which is to be widened by using the rock from the cut, the rock was dumped on the mat of roots and permitted to settle as it would. The rate of settling was very slow indeed, being only 2 feet during the entire winter when the swamp was not frozen over at any time. A short experimental section of the swamp west of the West Shore Railroad overpass was blasted to speed up the settling. It was decided that this method would be too expensive for the entire length of the work and that the blasting might also damage the water main by propogation of the shock through the swamp water so the contractor went at the problem in a different manner.



The Blacksmith Shop

The P & H 300, rigged as a crane and with a ½-yard clamshell bucket, dug a trench through the swamp roots to a depth of 4 or 5 feet for a distance of 2,000 feet and for a width of 10 feet. This method worked out very well indeed and the rock fill settled rapidly for the entire length of the trench as soon as dumped.

To furnish fuel oil for the furnace a 500-gallon fuel oil tank was installed close to the road where it could be readily filled from a service truck. A well-kept service truck with a rectangular gasoline tank built into the front of the bed and with a regulation gasoline pump visited the equipment regularly and kept the gasoline tanks filled.

PERSONNEL

This rock cut and swamp fill contract was handled by the Waterbury Concrete Construction Co. of Suffern, N. Y., of which Anthony Cucolo is President and General Manager, with Eugene Cavallo as Superintendent. For the New York State Department of Public Works, Division of Highways, the work was in charge of J. S. Bixby, Division Engineer, Poughkeepsie, N. Y., with N. F. Ronan, County Assistant Engineer and E. C. Getty, Field Engineer.

Cotton Mats for Curing Concrete

THE Division of Tests, United States Bureau of Public Roads, has recently completed a research program to determine the efficiency of cotton mats of various thicknesses for the protection of concrete while curing. The importance of minimizing temperature changes within concrete, especially during the early curing period, is well recognized. In connection with this problem the possibility of utilizing the heat insulating properties of mats made up of several plies of raw cotton separated by loosely woven cotton cloth had been suggested and samples of cotton containing three, six and nine plies of cotton were submitted for test purposes by the Texas State Highway Department. These mats measured approximately 1, 2 and 3 inches in thickness respectively. The dry mats weighed 0.7, 1.2 and 1.7 pounds per square foot for 3, 6 and 9-ply mats respectively. The tests were conducted by the Bureau of Public Roads at the Arlington Experimental Farm to determine the efficiency of these mats for curing concrete. The tests involved two separate investigations, one a study of the heat-insulating value of the mats when applied to a concrete surface and the other, the ability of the mats to retain moisture within the concrete and thus promote efficient curing.

The experiments carried on to determine the efficiency of cotton mats as a substitute for wet burlap in the curing of concrete has revealed the following facts:

1. Cotton mats were proved effective in providing insulation from the heat of the sun's rays. Under the condition of the tests, the 24-hour temperature range under cotton mats was approximately 35 per cent of that which occurred in uncovered concrete and about 60 per cent of that in concrete covered with wet burlap.

2. The insulating properties of various thicknesses of mat, ranging from 1-ply, about 1/3-inch thick, to 9-ply about 3 inches thick, appeared to be about the same.

3. Modulus of rupture tests showed that cotton mats, wet once and placed with the wetted side on the concrete, were as effective in curing as was double thickness burlap kept continuously wet, the curing period in both cases being three days.

4. Cotton mats applied dry proved less effective in curing than wet mats or wet burlap, the specimens developing about 88 per cent of the strength of those cured by the other two methods.

5. The various thicknesses of mat used appeared to be equally effective as curing agents for concrete.

The Editor Comments

Some Outstanding Advantages of the Proposed Code for the Highway Construction Industry

A careful study of the proposed code for the Highway Construction Industry which has been presented by the American Road Builders' Association to the NRA officials shows several features which will definitely eliminate some of the unethical practices which have been prevalent in the industry for some time. Just as the cotton textile code wiped out child labor, so will the new highway code prevent bidding below cost, eliminate "bid shopping" and do away with the use of convict labor.

Contract Prequalification Requirements

The proposed code makes it mandatory that all highway contractors shall file complete information regarding performance and financial status with the Bureau of Contract Information, Inc., Washington, D. C., or such other agency as may be designated by the National Recovery Administration. Thus at last the highway construction industry evaluates in its true perspective the fine work done by the Bureau of Contract Information and the value of responsibility and competence as an asset in a construction organization which should be recognized by Federal and local governmental units awarding contracts.

Bids Below Cost Prohibited

A very definite blow to "unbalanced bids" is dealt by the paragraph which prohibits a contractor from knowingly submitting a bid or accepting a contract which does not include all direct and indirect costs. Further, he is required to include a reasonable amount for profit which it is an all too well known fact today has not been the case for several years. A contractor first used the excuse "I want to keep my organization together." Then next, "I've got to bid below cost to get the job," and each time there was no profit in the contract. Now the contractor must bid all items at cost plus profit.

Bids Confidential

The next unethical practice which has been all too common and which is dealt its death blow in the Highway Construction Industry Code is shopping for bids. The code states that, "A general contractor shall not, prior to the award of a particular subcontract, convey to any subcontractor or material vendor any substantial information relating to the bid of any other subcontractor or material vendor, who has made a bid to him or to any other general contractor, nor shall he mislead, or deceive any subcontractor or material vendor as to the amounts and conditions of other bids for the purpose of obtaining a lower bid." All fair minded contractors will say, "Amen" to this provision.

Convict Labor Prohibited

The code provides that no person signing the code shall employ penal labor nor knowingly use materials produced by penal labor. This definitely does away with the threat of competition with convict labor which has been hanging over the heads of contractors operating in the southern states.

Enticement of Employees

It is unfortunate that in the past many larger contractors have made the contracts of their smaller competitors unprofitable by offering better wages to key employees, thus depriving the smaller contractor of their services on which he had relied for the economical and profitable completion of the contract. This is definitely outlawed by the single sentence, "Interference with a competitor's business through the employment or enticement of his employees from employment shall be deemed an unfair method of competition."

Accident Prevention

The writing into the highway construction code of a definite Safety First requirement will do much to raise the safety standard of construction and to eliminate many of the hazards which have preyed upon the life and limb of construction labor. The code requires that every employer shall lend his cooperation and active support toward reduction of accidents in the conduct of his operations and he shall not expose his employees unnecessarily to dangerous working hazards.

All Power to the Code

Industry today is based upon codes. Probably not one of these codes has been entirely satisfactory to every member of the industry it covered. The Highway Construction Industry Code supplemental to the Construction Industry Basic Code does seem, however, to offer to the construction industry as a whole the fairest basis of legitimate competition, with opportunities for fair profits for every organization built upon honesty and financial responsibility and operated with due regard to safety.

Theodore Reed Kendall

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Read Before Signing

Somebody a long time ago proposed that all lawyers be hanged. But the suggestion did not take—perhaps because there were too many laymen wondering how they would get out of trouble if there were no lawyers. If there are those who are disposed to help exterminate lawyers, the legal editor of CONTRACTORS & ENGINEERS MONTHLY suggests that it might be accomplished by business men becoming more businesslike.

A good place to start is to make it a rule never to sign a document without making sure just what it says and means. A large percentage of lawyers owe their bread and butter—and Packards—to undue haste of laymen in autographing papers.

In a case lately before the Georgia Court of Appeal (161 S. E. 639) it appeared that the defendant had signed a note and contract, containing provisions that proved to be very unsatisfactory to him. He tried to "duck" them on the ground that he was very busy when the papers were presented to him to be signed, and that he took the other chap's word for what was in them. The Court ruled that he showed no good excuse and fell within the well established rule of law that one signing a contract without reading it is bound by all of its terms, unless he can show that he acted under an emergency reasonably excusing him from reading it, or having it read to him, or unless the other party fraudulently hoodwinked him into omitting to read. Don't take the other fellow's word for what is on the paper you are signing!

State Loses Main Branch of Highway Contract Lawsuit

Classification of material excavated on a highway grade construction contract was the principal bone of contention in the case of State v. Wright, 175 N. E. 666, decided by the Indiana Appellate Court April 15, 1931.

At the outset, the court noted that where a state enters into a contract it lays aside its sovereign attributes and is bound very much the same as an individual would be under the same sort of contract.

Then it was decided that where the parties classified materials excavated, while the job was in progress, the State Highway Commissison could not arbitrarily change the classification afterwards to the prejudice of the contractor.

The state challenged the contractor's right to reimbursement for extra work, on the ground that certain conditions of the contract relative to such work had not been performed—such as securing writing covering same, etc. But it appeared that the job had been accepted by the commission and a concrete surface placed upon the grade. On that point and on an interesting point decided in favor of the state, the court said:

"To permit the state to accept the work and labor of appellees, and receive the full benefit thereof, without being required to pay the contract price, would be inequitable and unjust and out of harmony with the rule heretofore announced by the courts of our state. . . .

"It was an error for the court to allow interest in the sum of $4,175.66. It is not the policy of the state to pay interest in the absence of a law or a contract stipulating for its payment. These are both lacking in this case."

Contract Involving Violation of Law Is Unenforceable

"This truck will make 28 miles an hour over the highway, with a gross weight of 21,000 pounds," warranted a seller as an inducement to a contractor to buy the truck for use in his business.

"I couldn't get more than 9 miles out of the truck," complained the buyer in claiming damages for breach of the warranty. "I want damages based on my loss of income through inability to haul as much material per day as I was thus induced to believe I could."

"But," said the California District Court of Appeal in the case of Shelley v. Hart, 297 Pac. 82, decided February 26, 1931, "we have a law in this state that no gross load of 18,000 pounds or more shall be driven over the public highways faster than 20 miles per hour. Therefore, you had no right to rely upon the warranty, because the law would not have let you drive 28 miles an hour."

The opinion quotes this well established rule of law: "Loss of profits may not be considered as an element of damages, where the business from which they would have resulted was, or would have been, conducted in violation of law."

The opinion does not leave it clear whether or not damages could have been recovered on the basis of failure of the truck to move the stipulated load at the maximum speed allowed by law. The court merely decided that since the proof of damage was based upon inability to move the truck at an unlawful speed there was no evidence to sustain an award of damages.

Accidents to Travelers on Uncompleted Roads

About 1 A. M. a Chrysler sedan ran into a road roller which lay across an unfinished highway that had been thrown open to traffic. The sedan got so much the worst of the encounter that it was rendered practically worthless.

The contractor thought that he ought not to stand the loss, although there was no light or other warning on or near the roller. But in an opinion handed down December 15, 1930, in the case of Dennis v. Stukey, 294 Pac. 276, the Arizona Supreme Court upheld a judgment in favor of the automobile owner. The court said:

"If the road was open to traffic, we think the failure to display lights on the roller was not excused because the road was still being rolled."

Highway Contractors Liable for Trespass Upon Abutting Land

"Thus far shalt thou go, and no farther!" Road contractors are bound to keep that injunction in mind when they come to the outside limits of the highways into which their contracts take them. For trespasses upon abutting land they may be held liable in damages.

That is the substance of what the Kentucky Court of Appeals said March 20, 1931, in handing down a decision in the case of Hall v. Ellis & Brantley, 36 S. W. 2d, 850. The injury complained of in that case was largely caused by blasting, resulting in rocks and other material being cast upon the plaintiff's property, injuring her garden, orchard, etc.

Construction Industry News

The National Bituminous Pavers' Industrial Association has been formed by the asphalt pavement producers for the purpose of adopting and putting into effect a Code of Fair Practice which is in keeping with the regulations and spirit of the National Recovery Administration. To obtain self-government of the industry, eleven regional administrators or directors were appointed from the industrial leaders of the asphalt paving business. The regions and directors are as follows: Region 1, New England States, E. Suteliffe, Vice President, Warren Brothers Co., Boston; Region 2, New York-Pennsylvania District, William P. McDonald, President, William P. McDonald Co., New York and Lakeland, Fla.; Region 3, Central Western States, George R. Cooke, President, George R. Cooke Asphalt Paving Co., Detroit; Region 4, Middle Western States, Gilbert W. Haggart, President, Haggart Construction Co., Fargo, N. D.; Region 5, Northwest States, Troy Carmichael, Northwest Road Co., Portland, Ore.; Region 6, California District, Arthur F. Brough, President, Southern California Roads Co., Los Angeles; Region 7, Southwestern States, Louis N. Lang, Craven & Lang, Inc., New Orleans, La.; Region 8, Corn Belt States, Daniel J. Boone, Webb-Boone Co., St. Louis, Mo.; Region 9, South Atlantic States, George B. Carey, President, Carey-Reed Co., Lexington, Ky., Region 10, Southern States, Larry B. West, President, West Construction Co., Chattanooga, Tenn.; Region 11, District of Columbia and Insular Possessions, A. G. Rolfe, McGuire & Rolfe, Washington, D. C. Of these directors, the following were elected officers for the ensuing year: President, E. Suteliffe; Vice Presidents, William P. McDonald and Larry B. West; Secretary-Treasurer, Troy Carmichael.

The American Diesel Engine Co., Oakland, Calif., has announced the appointment of J. H. Howell as Sales and Advertising Manager in charge of the marketing of a new diesel engine designed for use in trucks, as well as for marine and agricultural uses. Mr. Howell, since 1926, has been with the general sales staff of the Caterpillar Tractor Co., previous to that being assistant sales manager of that company's western division.

Allied Construction Equipment Co., St. Louis, Mo., has moved to new quarters more centrally located at 4025 Forest Park Blvd., St. Louis, Mo.

General Electric Co. and four of its associated companies have announced the removal of their offices in New York City to the new General Electric Building, 570 Lexington Avenue at 51st Street. The field engineering division, except the New York district engineer and the application engineering division which are now in the new building, the construction division, order service division, New York service shop and the warehouse are still located at the service building of the company at 414 West 13th Street.

Chicago Pneumatic Tool Co., New York City, has announced the opening on September 1 of a new branch office at 1028 Sixth Ave., So., Seattle, Wash., with A. M. Andresen as Manager. A representative line of the company's products, including pneumatic tools, rock drills, electric tools, air compressors, vacuum pumps and condensers, rock bits, and diesel, semi-diesel and gas engines will be carried in stock as well as parts for servicing C-P equipment.

Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., has announced that its distributor, The Mine & Smelter Equipment Co., Phoenix, Ariz., which has represented the Link-Belt Shovel and Crane Division for a number of years, has moved to larger and better quarters closer to the heart of the city at 110-116 S. Third Ave. R. C. Kaster is Manager of the Construction Department.

Distributors Wanted—A bin and batcher manufacturer of a nationally advertised product desires representation in eastern Florida, eastern Tennessee, in the north and extreme west sections of Texas and in the State of Iowa. Distributors wishing to establish contact with this manufacturer should write to Box E-101, Confidential, Care of CONTRACTORS AND ENGINEERS MONTHLY, 470 Fourth Ave., New York City.

A New Line of All-Wheel-Drive Trucks

A COMPLETE new line of four and six-wheel-drive motor trucks, consisting of twenty-one models with capacities from 1½ to 20 tons, has recently been announced by the Marmon-Herrington Co., Inc., Indianapolis, Ind.

This new line is divided into four series of four and six-wheel-drive trucks, two of which are entirely new and two consisting of improved and refined models. All vehicles are offered in either two or three wheelbase lengths and most of them can be purchased in one of two tire sizes.

Five smaller four-wheel-drive models are grouped in the new A series, including a 1½-ton model, a 2½-ton model, a 3½-ton model and two 4-ton models. The next series, known as the TH-4 series, comprises six four-wheel-drive models ranging in capacity from 4½ to 9 tons. Five six-wheel-drive models are grouped in the TH-6 series, with capacities of 10 to 20 tons. The fourth group is the THD series and consists of six models powered by diesel engines. Three of these models are four-wheel-drive and three six-wheel-drive models, with capacities ranging from 7 to 20 tons. The introduction of these models is the initial entrance of the Marmon-Herrington Co. into the field of diesel-powered trucks.

The entire new line is built around the Marmon-Herrington type of all-wheel-drive design and construction. All twenty-one of the new trucks have certain features in common, such as the front axle design, auxiliary transmissions to supplement the standard transmissions, the latest-type heavy-duty six-cylinder engines, all of which have seven-bearing crankshafts. Another important feature of all models is the low center of gravity and extreme stability on hills, rough terrain and side-hill grades, to increase its all-around performance and safety. The specifications of the six diesel-powered models in the THD series are the same as the corresponding gasoline-powered models with the exception of the necessary installation changes.

Proceedings of the American Toll Bridge Association

THE American Toll Bridge Association has recently published the first number of its *Annual Proceedings* containing the papers and reports presented at the Annual Convention held at the office of the Delaware River Bridge Commission, Camden, N. J. These *Proceedings* contain the following papers: Survey of the Toll Bridge Field; Toll Bridge Operation; The Relation Between Toll Rates and Bridge Income; Bridges of the Wheeling and Belmont Bridge Company; Highway Bridges; Report of Committee on Accounting; Report of Committee on Insurance; and List of Operating Toll Bridges in the United States. Copies of these *Proceedings* may be secured from the Secretary, American Toll Bridge Association, 1024 Vermont Ave., Washington, D. C. Price: $1.00.

A New Shovel Utility

A DISTINCTLY new device for convertible shovels which still further extends the utility of these universal machines has been developed by the Keystone Driller Co., Beaver Falls, Pa. The typical power shovel has for many years consisted of a crawler-mounted revolving machine, equipped with conventional dipper sticks and dipper, and convertible into a crane, skimmer and a trench hoe. To these utilities Keystone has now added another feature, a 3,000-pound patented hammer, mainly intended for general demolition purposes.

The hammer weighs 3,000 pounds and is capable of delivering 20 blows per minute with a drop of 5 to 10 feet. A sharp pull on the hauling line at the beginning of the drop augments the striking force, giving the hammer a greater effectiveness for its size than a simple gravity tool such as a pile driver or skull cracker. The hammer head is rigidly attached to a tubular handle about 8 feet long, which is hinged to the boom end. The method of attachment is somewhat similar to that employed on the Keystone pullscoop or trench hoe. As on the latter, the joint is free and flexible and blows may be struck in rapid succession without undue strain on the joint, which is caught by the hoisting line before the tool strikes the ground, with the stick or handle in approximate alignment with the boom.

The New Keystone Demolishing Hammer

The applications of the power hammer promise to be almost as numerous and varied as that of the hand hammer. Among the more obvious of these applications are breaking reinforced concrete pavement, breaking ice or frozen earth crust, demolishing small structures, fences, walls and parapets; breaking castings in scrap yards, foundries and steel plants; breaking shale and sandstone boulders which are too hard to dig with a shovel and which would otherwise have to be blasted; breaking over-size rocks and other obstructions encountered in excavation, or to be used on layer compacted fills; tamping, and for driving short piles, fence posts, etc.

It can be used for pushing, pulling or turning over large rocks and other heavy objects, so as to bring them into the desired position for hammering or breaking. The hammer head has a removable striking face which may be of any desired shape, flat, convex, concave or semi-spherical, like a ball peen, and special applications may suggest an axe, pick, mattock, or fork-shaped tool. The operation or effective application of these tools is facilitated by the employment of planetary clutches, which are standard on all Keystone excavators. The planetary clutch design imparts greater speed and ease of operation than is obtainable with the customary clutch and brake operation as the former, with V-friction grooves, can be operated for extended periods as a combination clutch and brake, without excessive wear and overheating.

A New Full-Diesel Engine

A 6-CYLINDER solid-injection, high-compression, full-diesel engine for automotive and general industrial purposes has been announced by the Hercules Motors Corp., Canton, Ohio. This engine is to be known as Model DX1 and has a 5-inch bore and 6-inch stroke and is constructed to operate at speeds up to 2,000 rpm.

The crankshaft of the new diesel is of the underhung type and is supported by the crankcase which can be had of either aluminum or cast iron and which extends 4 inches below the crankshaft center, forming a deep tubular rib to give side stiffening to the case and to which is bolted a pressed steel oil pan. Through bolts from the main bearing caps pass through the crankcase, cylinder block and heads to clamp these members rigidly together. Because of this construction with the eccentric heads, any and all parts above the crankcase can be removed without disturbing the main bearing caps if occasion requires.

The cylinder liners are of the wet sleeve type mounted in the cylinder block with a copper gasket seal at the top shoulder and rubber rings at the bottom. The timing gears are mounted on the end opposite the flywheel with a trunnion above the crankshaft projection for three-point mounting. A silent chain drive at the front of the camshaft gear drives the fuel pump at half engine speed. The fan is belt-driven from a pulley on the extended water-pump drive shaft and when an air compressor is required for brakes or other purposes, it is mounted on a bracket attached to the gear cover and belt-driven from the same belt that drives the fan.

The overhead valves are actuated by drop-forged rocker arms drilled for valve-stem lubrication and mounted on a hollow hardened and ground shaft held in brackets bolted to the cylinder head. The camshaft is located in the crankcase and is a one-piece forging accurately ground. Special attention has been given to obtaining quietness and smoothness of operation. The crankshaft is of large dimensions, drop-forged from chrome-nickle molybdenum steel and is finished to precision with highly polished bearing surfaces. In general the external mounting dimensions have been made interchangeable with Hercules HX series of gasoline engines.

The Model DX1 will develop from 100 hp at 1,000 rpm to 177 hp at 1,800 rpm, and 188 hp at 2,000 rpm with a B.M.E.P. of 110.3 pounds, 109.6 pounds and 105.5 pounds respectively. The fuel consumption is 0.383 pounds per brake horsepower per hour at 1,000 rpm, 0.430 pounds per brake horsepower per hour at 1,800 rpm and 0.46 pounds per brake horsepower per hour at 2,000 rpm with the above B.M.E.P.

A New Model ¾-Yard Shovel

THE new model standard ¾-yard shovel, which is a full-revolving convertible machine, has recently been announced by Bay City Shovels, Inc., Bay City, Mich. This machine is rated as a 10-ton crane and in addition to the shovel is available with clamshell, dragline or trench hoe buckets.

This machine is constructed of light weight tough alloy steels with heat-treated gears, providing a combination of handy economical weight with speed, power and endurance. The patented features and refinements of the larger Bay City models have been included in the design of this new light-weight unit. Among the features of this shovel are noiseless helical cut gears, unit cast alloy steel heat-treated car body and machinery table, frictionless bearings throughout, 6-cylinder power, extra large diameter swing roller path, oversized clutches and brakes, alloy steel crawler shoes, long crawlers with low bearing pressure, chain crowd with automatic adjustment, swing lock in any cab position, automatic travel lock and extra heavy cab with plenty of inside working room.

Barrett Tarvia

GOOD ROADS at LOW COST

State Highway No. 2, at Staples, Minnesota. Tarvia since 1927.

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St. Louis	Minneapolis	Boston
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TARVIA is more than a road-building material—it is a complete service developed by The Barrett Company, America's oldest and most experienced manufacturer of coal-tar road-building materials.

It is a service which includes uniformly dependable products in grades to meet every road construction, repair or maintenance requirement. It includes Barrett's unmatched delivery and application facilities. It includes, also, the intelligent but unobtrusive advice and cooperation of trained Tarvia field men with a background of 29 years' successful paving experience.

These are factors which practical road engineers and highway officials will want to consider carefully. Tarvia may cost slightly more per gallon, but the Tarvia road will cost less per year per mile. When you buy Tarvia you save money—and time. And you can be sure of the result—a smooth, easy-riding, skid-safe road.

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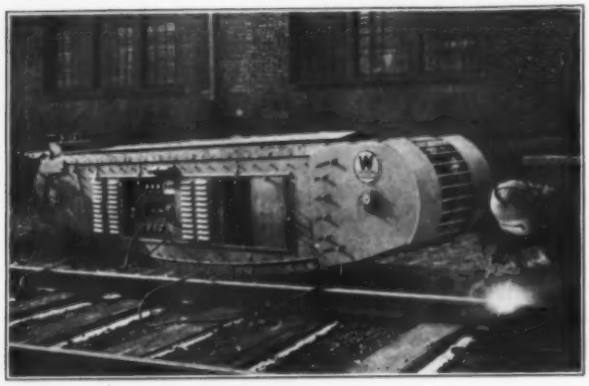
Ask the Tarvia field man, or write us, for a copy of the new Barrett Road Book containing tables and useful information about Tarvia and Tarvia-lithic.

During September we hope you will remember to mention CONTRACTORS AND ENGINEERS MONTHLY.



The New Westinghouse Tractor Welder

A New Electric Welder for Tight Places

A UNIQUE tractor welder, originally developed to fill the need for a mobile power-supply unit which does not require frequent transferring to and from railroad tracks for movement from one point to another, has been developed initially for railroad service by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This peace-time tank, as it has been called, is bound to have large application in the industrial field and on contracts where a large amount of welding must be done in relatively confined spaces.

The machine is a long narrow tractor powered by a gasoline engine and equipped with a complete welding apparatus. It is nearly 18 feet long, 30 inches wide and 36 inches high and runs at 1½ miles per hour. Its narrow width and low height permit it to be parked between adjacent tracks without interfering with passing trains and will permit its work in confined spaces on construction work. Although it may weigh more than 5 tons, this industrial welder is almost as maneuverable as the wartime tank. It easily ambles over railroad rails, climbs an 8-foot ramp onto a standard railroad flat car, fights up a steep 30 degree bank and runs along side slopes as steep as 45 degrees without tipping over. It turns around in a space the size of a 3-foot circle and can extend nearly half its length beyond the top of a wall or slope without toppling over.

When the welder is spotted in place, its generators furnish electric current for welding and for driving other electric repair tools. It is planned also to develop this same unit for use in oil and pipe line construction. Six of the present type of welders have been built by the Westinghouse Company for the Lehigh Valley Railroad.

A New Air-Cooled Truck Engine

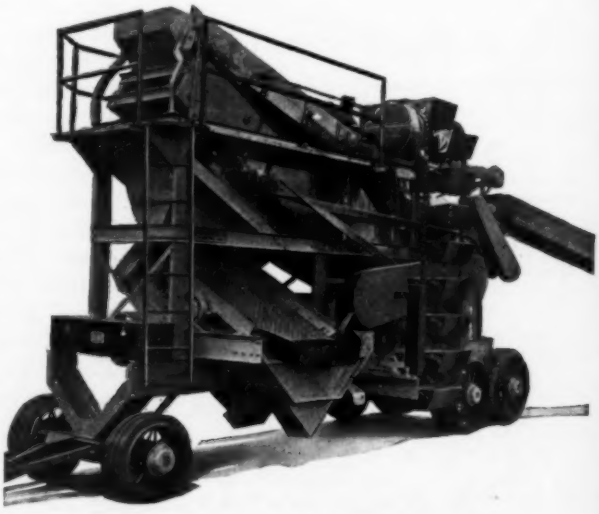
A 6-CYLINDER truck engine which has been under development for many months has just been announced by Doman & Marks, 101 Court St., Syracuse, N. Y. Included as features are practical airplane construction in the air-cooled cylinders, a powerful turbine fan which will cool the engine efficiently even when the atmospheric temperature is as high as 150 degrees Fahrenheit, full force lubrication that eliminates all interior tubing and leads, an oil cooler and hydraulic valve clearance compensators that keep the valve clearance at zero.

This is believed to be the only air-cooled engine larger than 12-horsepower available for contractors and for truck use. This engine will be used in heavy-duty trucks, tractors, compressors, industrial locomotives and other industrial applications. A 4-cylinder engine is also being developed to provide high torque at low speed for various industrial applications.

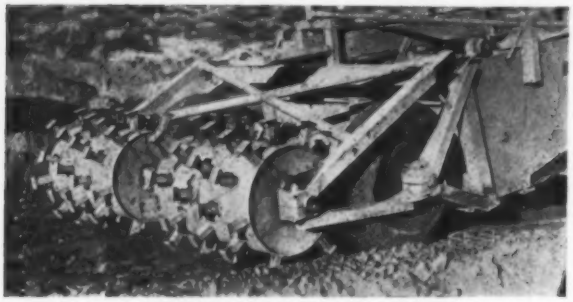
A New Triple-Service Crushing, Screening and Washing Plant

THE new Badger triple-service crushing, screening and washing plant, which is designed to perform the work of three separate units in one portable plant, has been announced by the Wisconsin Foundry & Machine Co., Madison, Wis. This plant supplies the need of a single portable crushing and screening plant where it is necessary to produce only one size of material and reject all fines; a multiple portable crushing and screening plant where it is necessary to produce two sizes of material and reject all fines; and a washing plant where the several sizes of material are separated, sized, washed and delivered to bins, to be used for concrete work.

The No. 40 Badger plant, as designed for producing two sizes of washed material, is made up of a 24-inch x 34-foot long conveyor delivering material from the pit to the plant with a universal drive, axle and steel swivel wheels at the tail end; a loading hopper with a grizzly at the lower end of the pit conveyor; a 36 x 96-inch double-deck primary vibrating screen; a 42 x 62-inch double-deck secondary vibrating screen; two sand eliminating screens, 36 x 36 inches on the upper secondary screen and 42 x 62 inches on the lower vibrating screen; a 9 x 36-inch Badger roller bearing jaw crusher for primary crushing; 30 x 16-inch rolls for secondary crushing; an 18-inch x 24-foot conveyor for sand delivery; a 18-inch x 46-foot conveyor for the large crushed material; a 18-inch x 46-foot conveyor with a separate engine drive for the small crushed material; two material hoppers, one under each screen; a pivoted bucket elevator delivering material from the crusher and rolls for rescreening; a pipe and spray system for the upper primary screen and the lower secondary vibrating screen; a 600-gpm centrifugal pump, a 36-inch x 13-foot dewatering flight sand conveyor and a washed sand and water pan carrying the water and sand from the sand hopper to the dewatering conveyor which is set on the ground parallel and adjacent to the plant and driven directly from the main plant through a universal drive. The plant is mounted on a truck of 12-inch I beams, 20 feet long with four 40 x 10-inch rubber-tired rear wheels and 28 x 12-inch front wheels with stub hitch.



The Badger No. 40 Triple Service Plant



The LeTourneau Scraper-Roller

A Combination Scraper and Sheepsfoot Roller

A COMBINATION of a scraper and sheepsfoot roller which tamps and compacts fills automatically has recently been announced by R. G. LeTourneau, Inc., Wilson Way at Roosevelt, Stockton, Calif. This scraper-roller was developed for use on fills where extreme compaction is required, or where it is desired to dispense with the use of a separate sheepsfoot roller.

In operation, it is mounted rigidly behind the rear wheels of a LeTourneau Carry-All scraper in such a manner as to be clear of the ground when the scraper is being loaded or when it is carrying its load. When the scraper arrives on the fill and the scraper blade is raised for dumping, the sheepsfoot roller automatically takes the load off the rear wheels and begins its tamping work. Because the dumping is always done in this position, the roller is in action as long as the scraper is on the fill. As the scraper leaves the fill, its blade is lowered and the weight is again carried on the rubber-tired wheels when the sheepsfoot roller automatically leaves the ground.

Three New 6-Cylinder Trucks

THREE new 6-cylinder trucks, known as 15A, 20A and 25A and rated at 1½, 2 and 2½-ton, respectively, have been announced by the Federal Motor Truck Co., Detroit, Mich. The new modern appearance introduced in Federal trucks this year is carried out in each of these new models and includes such features as long streamline hood and cowl, door-type ventilators, wide fenders, large chrome-plated slanting V-type radiator, wide chrome-plated front bumper and full chrome-plated headlights with twin disc chrome-plated horns mounted underneath.

The outstanding characteristic of these new trucks is their sturdy and substantial construction. The frames have a maximum depth of 8½ inches and the chassis weights are 3,500 pounds for the 1½-ton model, 3,900 for the 2-ton and 4,500 for the 2½-ton model. These trucks are equipped with 6-cylinder seven-bearing truck engines which furnish power at a low governed engine speed. All three engines are similar in design, differing only in size. Each is governed at 2,600 rpm. Their features include three-point suspension with rubber mounting, force-feed lubrication and down-draft carburetion.

Other features of these trucks are long-wearing dry-plate clutches, 4-speed transmissions on the 1½ and 2-ton models and 5-speed transmission with the silent fourth on the 2½-tonner, full-floating rear axles, rubber-bushed spring eyes which require no lubrication, roller-bearing universal joints and four-wheel hydraulic brakes. In the design of these new models, special attention has been given to the welfare and comfort of the driver. Noise and vibration have been reduced or eliminated wherever possible. All models are supplied with a wide choice of wheelbase lengths to accommodate various sizes of body equipment.

Bottom-Dump Trailers for Heavy Dirt Moving

BOTTOM-DUMP trailers, designed especially for operation under sandy soil and soft or rough ground conditions where a light running unit capable of withstanding the hardest kind of service is desired, have been announced by the Athey Truss Wheel Co., 5631 W. 65th St., Chicago, Ill. Athey Forged-Trak bottom-dump trailers are furnished in six capacities: the 5 and 6-yard units are mounted on Model C 10-ton Forged-Trak wheels, the 7 and 8-yard units on Model D 15-ton Forged-Trak wheels and the 10 and 12-yard trailers on Model E 20-ton Forged-Trak wheels. All of these units are arranged for use with an elevating grader, shovel or dragline. They are readily handled either singly or in train.

In developing this series of trailers, strength and rigidity of mounting were considered absolutely necessary in the design of the drawbar. To absorb the shocks of loading and roading, a double-acting spring-mounted hitch was incorporated, thus creating a full-cushioned floating drawbar. The body has sides and ends of special high carbon steel plate, reinforced at the top by bulb angles and cast steel corner brackets. The top of the body has a modified taper, which with the low loading height minimizes interference with the carrier of the elevating grader when working on slopes or in ditches. The body extension is reversible for mounting on the opposite side which is desirable when running with elevating graders equipped with a power-driven carrier. The top of the center partition is lower than the lowest side of the body, eliminating interference with a dipper or bucket when loading. This center partition is reinforced at the top with a heavy bar of steel and is riveted to the sides of the body.

The winding mechanism is completely mounted on a channel sub-frame bolted to the body. The winding shaft rotates on anti-friction bearings which are protected by oil retainers. The cable winds on two tapered steel drums, so located that the cable winds evenly on the taper without overlapping. The hand-wind lever and the dump lever are extra long and are so located that they are easily reached and operated.

The axle brackets are heavy box-section steel castings bolted to the side sills and the heat-treated stub-axles are securely clamped and bolted in place. The main axle is made of heat-treated high carbon steel held securely in place by bolts through the bracket and axle. It is mounted forward of the center to give a better balance to the body. The Forged-Trak wheels have sealed track-pin bearings, a wheel track of the high-rail type, a positive non-clogging track assembly composed of drop-forged links having integral interlocking arms and bolted-on track plates. This track combined with track wheels mounted on ball bearings produces a type of tracklaying wheel of exceptional life and light running qualities. It is especially adapted for use under extreme abrasive soil conditions.

The New Athey Forged-Trak 12-Yard Trailer

The Roads themselves don't last as long..

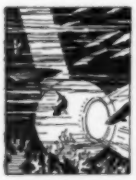
NORMALLY, culverts made from GOHI Corrugated Pipe outlast the roads under which they're laid. Dozens of them have been lifted and relocated, still good, while the road was worn out or the need for culverts eliminated.

Such economy is but one of twelve savings — twelve reasons why culverts from GOHI Corrugated Pipe save tax-payers money. Others are speed of installation, strength to withstand the stresses and strains of freezing water, the vibration of heavy traffic, less traffic tie-up, lower first cost, and last cost.

The reason for the long life of GOHI Corrugated Pipe is the metal itself — pure iron alloyed with the right amount of copper for maximum strength, life, and resistance to wear, weather and corrosion.

The complete facts make an interesting story which the fabricator nearest you will be glad to tell you in complete detail.

Only metal could meet this test . . . that's why it was chosen



When William Beebe descended a half mile and more into the sea, his observation room was made of metal. Only metal could withstand the tons of pressure exerted by the crushing water. It was an implosion he feared, the same thing that happens when settling fills crush the ordinary culverts not made of metal. Only metal has the flexibility to give under such tremendous pressures. GOHI Corrugated Pipe meets every culvert demand.

GENUINE OPEN HEARTH IRON GOHI PURE IRON - COPPER ALLOY

(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

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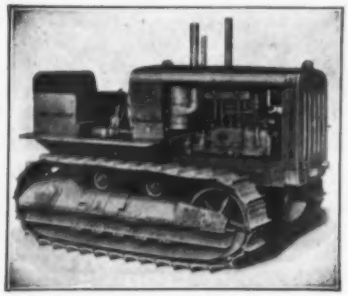

The New Diesel-Powered Caterpillar Thirty-Five

A New 35-HP Diesel-Powered Tractor

ALTHOUGH the Diesel Thirty-Five tractor just announced by the Caterpillar Tractor Co., Peoria, Ill., contains many interesting features, it is really new in name only, since it brings the established Caterpillar diesel engine to the chassis of the Thirty-Five tractor. Even the engine is not new, as it differs only in horsepower and number of cylinders from the engine used in the Caterpillar diesel Seventy-Five and diesel Fifty tractors, which have been in the field for many months. The three-cylinder engine in the diesel Thirty-Five has the same bore and stroke, bearings, cylinder liners, connecting rods, pistons, wrist pins, front end drive, governor, fuel injection pumps, valves and valve mechanism that are used on the two larger tractors.

Full force feed lubrication, a statically and dynamically balanced crankshaft supported by four large main bearings, four forward speeds ranging from 1.7 to 4.6 miles per hour, and 13,900 pounds of weight balanced by approximately 2,000 square inches of traction are some of the other outstanding features of this new model. The standard machine has a 53-inch tread from center to center of the 14-inch tracks, and wide-gage models with a 74-inch tread and track shoes of various widths are available for use on soft ground or steep hillsides. Positive starting under all conditions is assured by an auxiliary gasoline engine mounted on the left side of the bloc which cranks the diesel engine through a Bendix, the arrangement used on the other Caterpillar diesels.

Speeding the Heating of Bituminous Materials

SOME interesting information on high speed and economical heating of bituminous materials with portable tank car heaters and boosters has been reported by Cleaver-Brooks Co., Milwaukee, Wis. One owner of a No. 2 Cleaver booster heated and unloaded 60,000 gallons of oil in one working day with this machine. During the season just past another booster unit heated approximately 175 cars while a third user with a one-car heating unit and two boosters heated approximately 3,000,000 gallons of road oil during the last season.

Cleaver tank car heaters are portable units, mounted on either trailers or trucks. They are built in four sizes with steaming capacities for varied requirements. Although designed primarily for heating tank cars of bituminous materials to pumping temperatures, they are also used for thawing out culverts and manholes and for steam cleaning machinery and trucks. These oil burning heaters steam rapidly from a cold water start, and develop full working steam pressure in 30 minutes. The manufacturer reports low fuel costs, no waste of condensate, low maintenance costs and readily controlled heating capacity.

Cleaver pumping boosters are used to heat bituminous materials to application temperatures, and to draw the heated material from the tank car into the distributor. They are mounted on trailers or skids for truck mounting and are built in two sizes.

A New Type of Delay Blasting Cap

A NEW all-metal delay electric blasting cap, which is said to be revolutionary in design, has been announced by the Hercules Powder Co., Inc., Wilmington, Del. The outstanding features of the new detonator are the firing and delay elements which produce practically no gas when burning. These features make possible the use of a solid, one piece, ventless shell. Having no hot gas, this new delay cap cannot cause ignition of the dynamite. Needing no gas-escape openings in the shell, no moisture can enter, a usual cause of misfires in other types of delays. U. S. patents have been applied for on this new cap and are pending at this time.

Broadening the Field of the Truck Mixer

IN 1931 the Jackass hoist was developed by the Chain Belt Co., 1666 West Bruce St., and the Heil Co., 1130 Montana Ave., both of Milwaukee, Wis., especially for raising truck mixers to increase the delivery range from the mixer. The hoist raises the discharge end of the drum about 8 feet above the ground so that the concrete can be chuted over an area approximately 75 per cent greater. Sidewalks can be poured across parkways without wheeling, and building foundations and walls can be chuted even when the truck cannot get within 10 to 20 feet of the hole. This mixer has been used advantageously on small paving and sidewalk jobs and practically all alleys and some street work can be "fanned" the full width.

A new feature of this Moto-Mixer is the one-man spout which rides beside the drum, replacing one fender, when the truck is traveling. When on the job one man swings it out of its cradle and into position, hooks the supporting rod and is ready to pour immediately. This new spout is so balanced and so light that a man can handle it with one hand.

The location of the drum rollers and bearings permits hanging the Moto-Mixer drum down between the body sills, providing an extremely low center of gravity and eliminating side sway. It carries its own 4-cylinder power plant equipped with an electric starter entirely independent of the power plant of the truck. This provides constant drum speed and sufficient surplus power for maneuvering the trucks in traffic, on hills or where tough going is encountered, which would not be possible if the mixer were propelled by a power take-off from the truck engine. Rex Moto-Mixers are made in 1, 1½, 2, 3, 4 and 5-yard units and the Moto-Agitator which is the Moto-Mixer without a water system is furnished in 1½, 2, 3, 4½, 5 and 7-yard sizes.

A 1933 Model Rex Moto-Mixer Pouring Concrete